Air Quality Monitoring

Whitemud Drive Area of Edmonton

Alberta Environment

June 2000 to June 2001 Final Report

Summary

Alberta Environment conducted a mobile, ambient air quality monitoring study at six locations near Whitemud Drive in west Edmonton. The study consisted of four surveys, over four seasons, for one year. The objectives of monitoring this area were: (1) to determine concentrations of air pollutants representative of the monitored locations near Whitemud Drive; (2) to compare air pollutant levels to data from permanent monitoring stations in Edmonton; and (3) to compare air pollutant levels to Alberta's air quality guidelines.

Alberta Environment conducts mobile air quality surveys each year as part of its air quality monitoring program. These monitoring surveys are unannounced and use the department's Mobile Air Monitoring Laboratory (MAML). Pollutants measured by the MAML included carbon monoxide, oxides of nitrogen, ozone, particulates, hydrocarbons, sulphur dioxide, hydrogen sulphide, total reduced sulphur and ammonia.

The MAML was used to monitor air quality at six sites in the Whitemud Drive area between 53rd Avenue and Anthony Henday Drive. A total of 191 hours of data were collected by the MAML on 16 days representing each season (four days in each season). Monitoring was conducted for a minimum of one hour at each site so that air pollutant levels could be compared to Alberta's one-hour air quality guidelines. Data collected by the MAML is presented in part one of this report.

An additional 32 air samples were collected near Whitemud Drive and were analyzed for major volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene and xylenes. These samples were collected primarily during the morning and afternoon traffic rush hours so that maximum VOC levels could be determined. VOC data collected during this survey are presented in part two of this report.

Findings

(1) No major air quality issues were identified in the Whitemud Drive survey area based on this monitoring survey. Ambient levels of all air quality parameters measured by the MAML were below Alberta's Ambient Air Quality Guidelines. However, the one-hour benzene guideline was exceeded in one of 32 VOC samples. Alberta has one-hour air quality guidelines for benzene, carbon monoxide, nitrogen dioxide, ozone, sulphur dioxide, hydrogen sulphide and ammonia. Maximum one-hour concentrations were:

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- 1.17 times the one-hour guideline for benzene;
- 21% of the one-hour guideline for carbon monoxide;
- 19% of the one-hour guideline for nitrogen dioxide;
- 72% of the one-hour guideline for ozone;
- 9% of the one-hour guideline for sulphur dioxide;
- 30% of the one-hour guideline for hydrogen sulphide; and
- 2% of the one-hour guideline for ammonia.

(2) With the exception of one sample, VOC levels (benzene, toluene, ethylbenzene and xylene) were low near Whitemud Drive. However, the one-hour guideline for benzene was exceeded in one sample collected during the morning traffic rush hour on June 13, 2001 in the Elmwood community (164th Street and 80th Avenue). This sample was collected about 100 m from Whitemud Drive during light and variable wind conditions and may have been caused by vehicle emissions from Whitemud Drive. The benzene concentration in this sample was 35 $\mu g/m^3$ (micrograms of benzene per cubic metre of air) compared to the one-hour guideline of 30 $\mu g/m^3$. The one-hour ambient guideline for benzene in Alberta is the most stringent in North America, and is 100 times more stringent than the U.S. Department of Health and Human Services permissible exposure limit for benzene levels in the workplace.

(3) Concentrations of chemicals associated with vehicle exhaust including carbon monoxide (CO), nitrogen dioxide (NO_2) and total hydrocarbons (THC) were generally low in the Whitemud Drive survey area. The maximum one-hour CO concentration was 2.7 ppm compared to the one-hour guideline of 13 ppm. The maximum NO_2 concentration was 0.041 ppm compared to the one-hour guideline of 0.212 ppm. The highest THC concentration was 4.4 ppm. Alberta does not have a one-hour guideline for THC, however levels above 10 ppm usually warrant further investigation. Maximum CO, NO_2 and THC levels at permanent monitoring stations in Edmonton for the same monitoring period were 9.3 ppm for CO (at the Edmonton Northwest station), 0.073 ppm for NO_2 (at the Edmonton Northwest station) and 10.0 ppm for THC (at the Edmonton East station). Maximum levels measured for these pollutants in the Whitemud Drive area survey were considerably lower. Vehicles are the major source of CO, NO_2 and THC. However, industry is a major source of THC in east Edmonton.

(4) High levels of large particulates were measured on several occasions during the Whitemud Drive area survey. These levels are indicative of traffic on or near Whitemud Drive. The maximum one-hour total suspended particulate (TSP) concentration was 459 $\mu g/m^3$. Maximum TSP levels from other mobile monitoring surveys conducted in Alberta range from 52 to over 2000 $\mu g/m^3$. Higher levels are usually measured adjacent to gravel roads with significant traffic. TSP consists of large particles that are important primarily from a nuisance perspective.

(5) Levels of small, respirable particulates ($PM_{2.5}$) were low near Whitemud Drive. $PM_{2.5}$ refers to particles that are small enough to be deposited into the lungs and can be a human health concern depending on their concentration and composition. The maximum one-hour $PM_{2.5}$ concentration measured during the survey was 37 $\mu g/m^3$. This maximum value is much lower than the one-hour equivalent concentration for the Canada-wide Standard in Alberta of 80 $\mu g/m^3$.

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Part 1: Monitoring Using the Mobile Air Monitoring Laboratory

Monitoring Method

Alberta Environment used the Mobile Air Monitoring Laboratory (MAML) to monitor air quality in the Whitemud Drive area from June 21, 2000 to June 14, 2001. A total of 191 hours of data were collected on 16 days representing each season on the dates indicated below.

- June 21 and 22, 2000; June 13 and 14, 2001 (summer seasonal survey).
- October 26 and 30, 2000; November 14 and 30, 2000 (fall seasonal survey).
- January 10, 2001; February 13, 16, 27, 2001 (winter seasonal survey).
- April 18, 19, 2001; May 3 and 24, 2001 (spring seasonal survey).

Six locations were monitored during the survey. Sites and alternate sites were selected so that monitoring would always be conducted downwind of Whitemud Drive. The choice of the site to be monitored was based on the wind conditions at the time of monitoring. For example, Site #1 (Brookside - located on the east side of freeway) would be monitored if the winds were primarily from the west and Site #1a (Ramsay Heights - located on the west side of the Freeway) would be monitored if the winds were from primarily from the east. Sites #1 to #5 (a and b) were located adjacent to the freeway while Site #6 (a and b) were located further downwind from the freeway.

Each monitoring site was visited twice per survey day so that pollutant levels during the morning and afternoon traffic rush hours would be represented. Also, each location was monitored for a minimum of one hour to allow comparison with the Alberta Ambient Air Quality Guidelines. The monitoring sites are indicated in Table 1.1 and Figure 1.1.

Data collected from the Whitemud Drive survey were compared with data collected at the three permanent monitoring stations operated by Alberta Environment in Edmonton. These are the Edmonton Central (10255-104 Street), Edmonton Northwest (13335-127 Street) and Edmonton East (105 Avenue and 17 Street) stations (see Figure 1.1). All times are reported as Mountain Standard Time (MST).

Table 1.1 MAML monitoring site descriptions in the Whitemud Drive area survey.

Monitoring Site*	Location	# of Hours Monitored
Site #1	Brookside – church parking lot at 53 Avenue and 144 Street (next to freeway on east side).	16
Site #1a	Ramsay Heights – 147 Street and 48 Avenue (next to freeway on west side).	1
Site #1b	Brander Gardens Park - northeast end of Riverbend Road - 145 Steet and Riverbend Road.	13
Site #2	John Janzen Nature Centre parking lot - (next to freeway in the river valley).	23
Site #2a	200m off Fox drive (on approach road to Fort Edmonton).	9
Site #3	Lynnwood – 152 Street and 79A Avenue (next to freeway on north side).	21
Site #3a	Rio Terrace – 154 Street and 78 Avenue (next to freeway on south side).	11
Site #4	Elmwood – 167 Street and 79A Avenue (1 block north of freeway).	20
Site #4a	Patricia Heights – 165 Street and 78 Avenue (next to freeway on south side).	12
Site #5	Aldergrove – 184 Street and 80 Avenue (next to freeway on north side).	19
Site #5a	Lymburn - 78 Avenue 184 Street.	12
	Furthur Downwind Sites	
Site #6	Rio Terrace – community league building at 155 Street and 76 Avenue (3 blocks south of freeway).	2
Site #6a	Quesnell Heights – Quesnell Crescent at 148 Street (2 blocks south of freeway).	19
Site #6b	Laurier Heights – 82 Avenue and 145 Street (4 blocks north of freeway).	13

* - a or b after the site number indicates alternate location for downwind positioning.

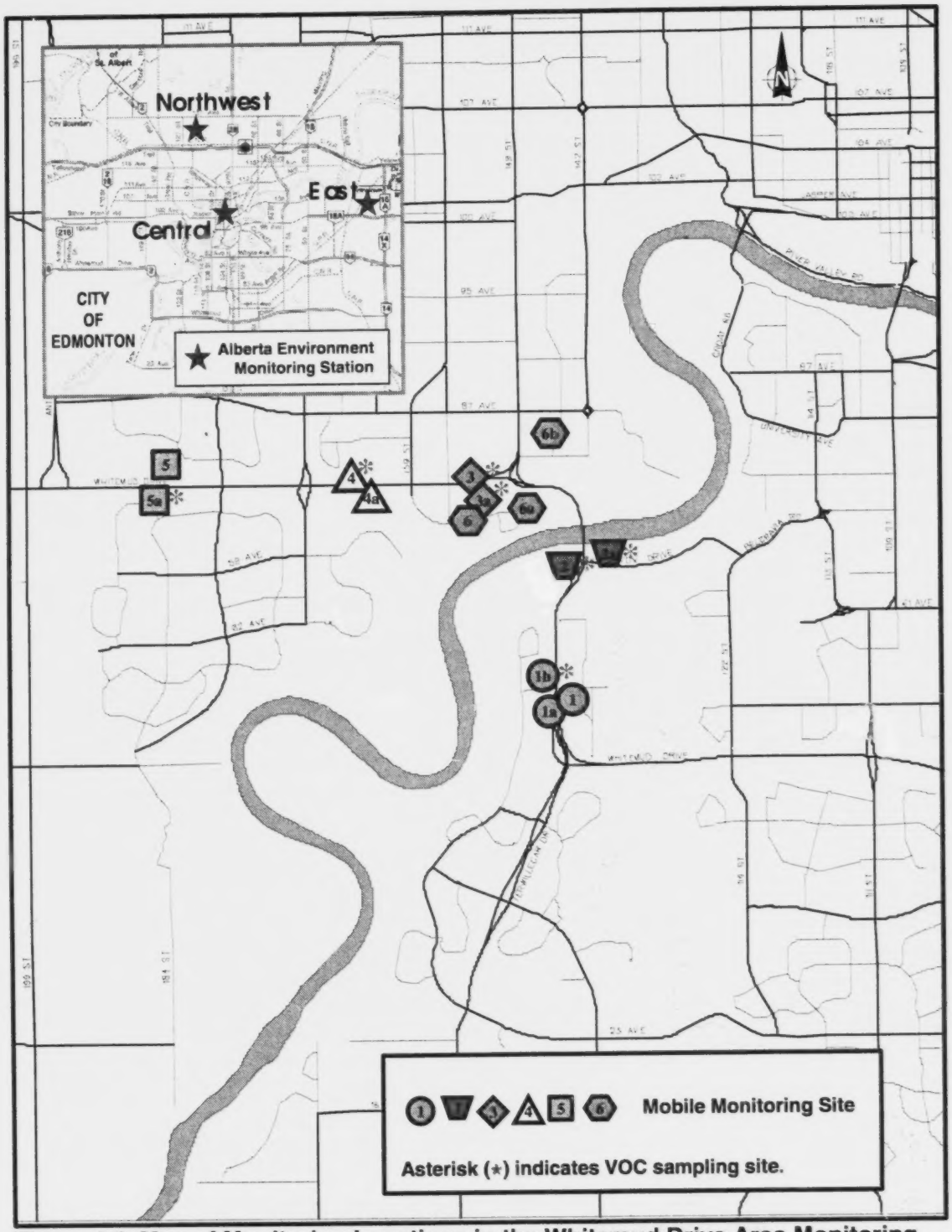

Figure 1.1 Map of Monitoring Locations in the Whitemud Drive Area Monitoring Survey.

The Mobile Air Monitoring Laboratory

The MAML is a 27-foot (8.2 m) vehicle that has been specially designed and equipped to measure air quality. It houses a variety of instruments that continuously sample the air at specified time or distance intervals. The MAML is equipped with:

- A dual computer system custom-programmed to accept and record the measurement of air samples from each analyzer.
- A GPS (Global Positioning System) that identifies the MAML's location as it moves around Alberta.
- An exhaust purifying system that minimizes emissions from the vehicle.
- Two on-board generators that are also equipped with exhaust scrubbers.

The parameters measured by the MAML during the Whitemud Drive area survey are indicated in Table 1.2. Tables A1 to A6 in the Appendix (pages 25 and 26), contain median and maximum air pollutant levels at all sites monitored during the survey and at permanent stations in Edmonton and Calgary. Hourly air pollutant concentrations, weather conditions and the MAML operator's comments for each location monitored are indicated in Tables A7 to A14 in the Appendix (pages 27 to 34).

Figure 1.2 Alberta Environment's Mobile Air Monitoring Laboratory (MAML).

Table 1.2 Parameters monitored by the MAML (also includes minimum detection limits and operating ranges).

Parameter Measured	Minimum Detectable Limit*	Operating Range**
sulphur dioxide (SO_2)	0.6 ppb	1 ppm
hydrogen sulphide (H_2S)	0.6 ppb	1 ppm
total reduced sulphur (TRS)	0.6 ppb	1 ppm
total hydrocarbons (THC)	0.005 ppm	20 ppm
reactive hydrocarbons (RHC)	0.005 ppm	20 ppm
methane (CH_4)	0.005 ppm	10 ppm
polycyclic aromatic hydrocarbons (PAHs)	3 ng/m^3	1000 ng/m^3
ozone (O_3)	0.001 ppm	0.5 ppm
nitrogen dioxide (NO_2)	1.0 ppb	1 ppm
nitric oxide (NO)	1.0 ppb	1 ppm
total oxides of nitrogen (NO_x)	1.0 ppb	1 ppm
total suspended particulates (TSP)	1 $\mu g/m^3$	1.0 g/m^3
inhalable particulates (PM_{10})	1 $\mu g/m^3$	1.0 g/m^3
respirable particulates ($PM_{2.5}$)	1 $\mu g/m^3$	1.0 g/m^3
carbon monoxide (CO)	0.1 ppm	50 ppm
ammonia (NH_3)	1.0 ppb	5 ppm
wind direction (WDR)	0 degrees	360 degrees
wind speed (WSP)	0 kph	200 kph
temperature (Temp)	-40 °C	50 °C
relative humidity (RH)	0 %	100 %

ppb = parts per billion
ppm = parts per million
ng/m^3 = nanograms per cubic metre
$\mu g/m^3$ = micrograms per cubic metre
g/m^3 = grams per cubic metre
kph = kilometres per hour
°C = degrees Celsius
% = per cent

* The ***minimum detectable limit*** indicates the *minimum* amount of pollutant the instrument can measure.

** The ***operating range*** indicates the *maximum* amount of pollutant the instrument can detect. This limit is set to provide the optimum precision over that range. The upper limit can be raised, however, precision at the lower levels (where most levels are monitored) is then compromised.

Alberta's Ambient Air Quality Guidelines

Alberta's Ambient Air Quality Guidelines[1] are established under Section 14 of the Environmental Protection and Enhancement Act (EPEA). EPEA provides for the development of guidelines and ambient environmental quality objectives for all or part of Alberta.

The Ambient Air Quality Guidelines are used for:

- Reporting on the state of the atmospheric environment in Alberta.
- Reporting to Albertans on the quality of air through an air quality index.
- Establishing approval conditions for regulated industrial facilities.
- Evaluating proposals to construct facilities that will have air emissions.
- Guiding special ambient air quality surveys.
- Assessing compliance near major industrial air emission sources.

Alberta's Ambient Air Quality Guidelines for one-hour concentrations of parameters monitored by the MAML are indicated in Table 1.3.

[1] *Alberta Ambient Air Quality Guidelines.* Alberta Environment. February 2000.

Table 1.3 Alberta's Ambient Air Quality Guidelines for parameters measured by the MAML.

Air Quality Parameter	One-hour Guideline (ppm*)	Basis for Guideline
hydrogen sulphide	0.01	odour perception
ammonia	2	odour perception
carbon monoxide	13	oxygen carrying capacity of blood
nitrogen dioxide	0.212	odour perception
ozone	0.082	reduction of lung function and effects on tomatoes
sulphur dioxide	0.172	taste, odour perception and effects on bluegrass

* Parts per million by volume.

Carbon Monoxide (CO)

max. one-hour concentration recorded during survey	one-hour guideline
2.7 ppm	13.0 ppm (based on the oxygen-carrying capacity of blood)

Carbon monoxide (CO) is a colourless, odourless gas emitted into the atmosphere primarily by motor vehicles. Minor sources include fireplaces, industry, aircraft and natural gas combustion. The major source of carbon monoxide is vehicle exhaust emissions.

CO values were well below the one-hour ambient air quality guideline of 13.0 ppm at all monitoring sites during the Whitemud Drive survey. The maximum concentration of 2.7 ppm is 21 per cent of one-hour guideline. This value was measured at Site #4 (Elmwood) from 6:54 p.m. to 7:57 p.m. on January 10, 2001. The next highest CO reading (2.2 ppm) was measured during the previous hour (5:41 p.m. to 6:40 p.m.) at the Site #6 (Rio Terrace) on January 10, 2001.

Average CO concentrations were consistent between all monitoring sites. The median CO concentration ranged from 0.3 to 0.4 ppm based on all data collected at the six monitoring sites.

The overall median and maximum CO concentrations during the Whitemud Drive survey were 0.4 and 2.7 ppm, respectively. These values are lower than or close to the same as concentrations measured at permanent monitoring stations in Edmonton over the same time period. The median concentrations at the Edmonton Central, Northwest and East monitoring stations for the same time period were 0.7, 0.6 and 0.3 ppm, respectively. The maximum one-hour CO concentrations at these three stations were 4.8, 9.3 and 2.8 ppm, respectively. The major source of CO at urban locations is vehicle exhaust emissions.

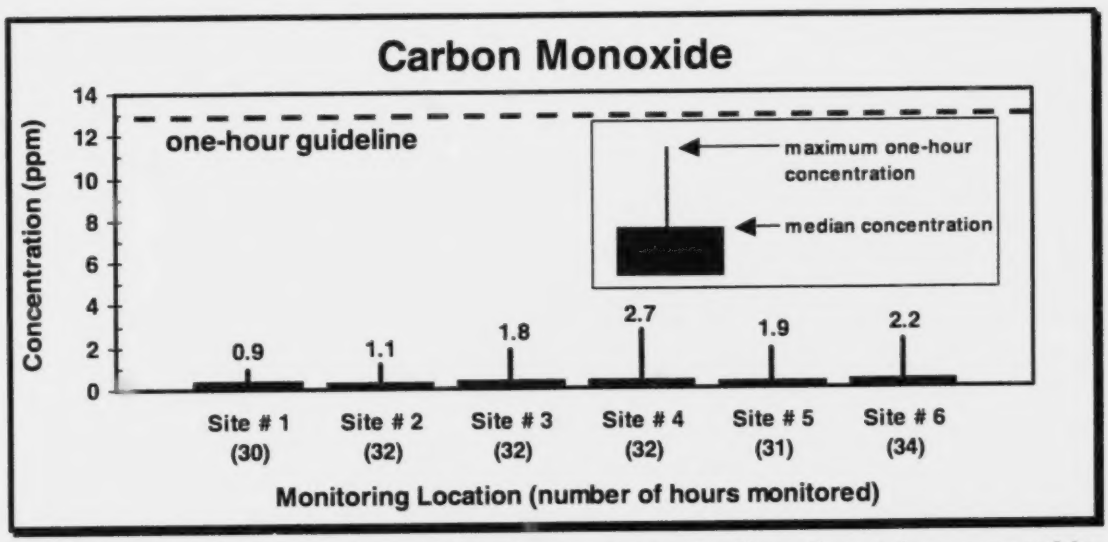

Figure 1.3 One-hour median and maximum concentrations for carbon monoxide.

Oxides of Nitrogen (NO_2, NO and NO_x)

max. one-hour concentration recorded during survey	one-hour guideline
NO_2 = 0.041 ppm	0.212 ppm (based on odour perception)
NO = 0.230 ppm	no guideline
NO_x = 0.262 ppm	no guideline

Oxides of nitrogen (NO_x) are the total of nitrogen dioxide (NO_2) and nitric oxide (NO). During high temperature combustion - as in the burning of natural gas, coal, oil and gasoline - atmospheric nitrogen may combine with molecular oxygen to form NO. NO is colourless and odourless. Most NO in the ambient air is oxidized to form NO_2. NO_2 is a reddish-brown gas with a pungent odour. The major source of oxides of nitrogen in urban areas is vehicle exhaust emissions.

NO_2 levels were below Alberta's one-hour guideline at all monitoring locations during the Whitemud Drive area survey. The maximum NO_2 concentration of 0.041 ppm was recorded at Site #3a (Rio Terrace adjacent to Whitemud Drive) on November 14, 2000 (4:23 p.m. to 5:29 p.m.) and at Site #3 (Lynwood) on February 27, 2001 (6:15 p.m. to 7:16 p.m.). This maximum concentration is 19 per cent of the one-hour guideline.

Median NO_2 concentrations ranged from 0.009 ppm at Site #5 (Aldergrove and Lymburn) to 0.019 ppm at Site #3 (Lynwood and Rio Terrace). The overall median NO_2 concentration at all sites was 0.014 ppm. This value is similar to median values measured at the Edmonton Northwest (0.016 ppm) and Edmonton East (0.013 ppm) stations over the same time period. The median NO_2 concentration at the Edmonton Central station was much higher with a value of 0.023 ppm.

The maximum one-hour NO_2 concentration measured in the Whitemud Drive area survey (0.041 ppm) was lower then maximum values measured at the Edmonton Central (0.057 ppm), Edmonton Northwest (0.073 ppm) and Edmonton East (0.050 ppm) monitoring stations.

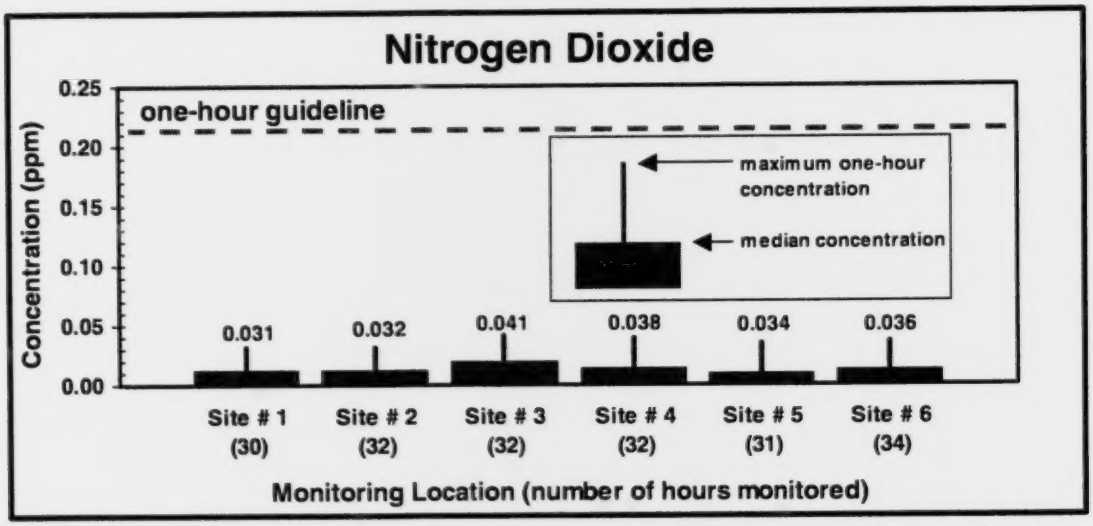

Figure 1.4 One-hour median and maximum concentrations for nitrogen dioxide.

Hydrocarbons (THC, RHC and CH_4)

max. one-hour concentration recorded during survey	one-hour guideline
THC = 4.4 ppm	no guideline
RHC = 1.6 ppm	no guideline
CH_4 = 2.7 ppm	no guideline

The term "total hydrocarbons" (THC) refers to a broad family of chemicals that contain carbon and hydrogen atoms. Methane (CH_4) is the most common natural hydrocarbon in the earth's atmosphere. Specific reactive hydrocarbons (RHC) are important because they can contribute to summertime smog or be toxic at high concentrations. Some sources of hydrocarbons include vegetation, vehicle emissions, oil and gas processing, chemical processing, dry cleaning, fireplaces, natural gas combustion, aircraft traffic and evaporation of solvents. Normal background THC concentrations recorded in rural Alberta range from 1.5 to 2.0 ppm. Background hydrocarbons are primarily composed of CH_4 with a small contribution from RHC (about 0.2 ppm).

The maximum one-hour THC concentration (4.4 ppm) was measured at Site #4 (Elmwood) on Jan 10, 2001 from 6:54 p.m. to 7:57 p.m. Maximum one-hour THC concentrations were less than 4 ppm at the other monitoring sites. Maximum one-hour THC concentrations at the Edmonton Central, Northwest and East monitoring stations over the same monitoring period were 2.6, 6.0 and 10.0 ppm, respectively. Because of the complex nature of individual hydrocarbons species, there are not ambient guidelines for THC.

Median THC concentrations were consistent between all Whitemud Drive area monitoring sites ranging from 2.1 to 2.2 ppm. This is close to the median concentration measured at the three permanent monitoring stations in Edmonton (2.2 ppm). A more detailed discussion of hydrocarbons measured near Whitemud Drive is presented in Part 2 of this report.

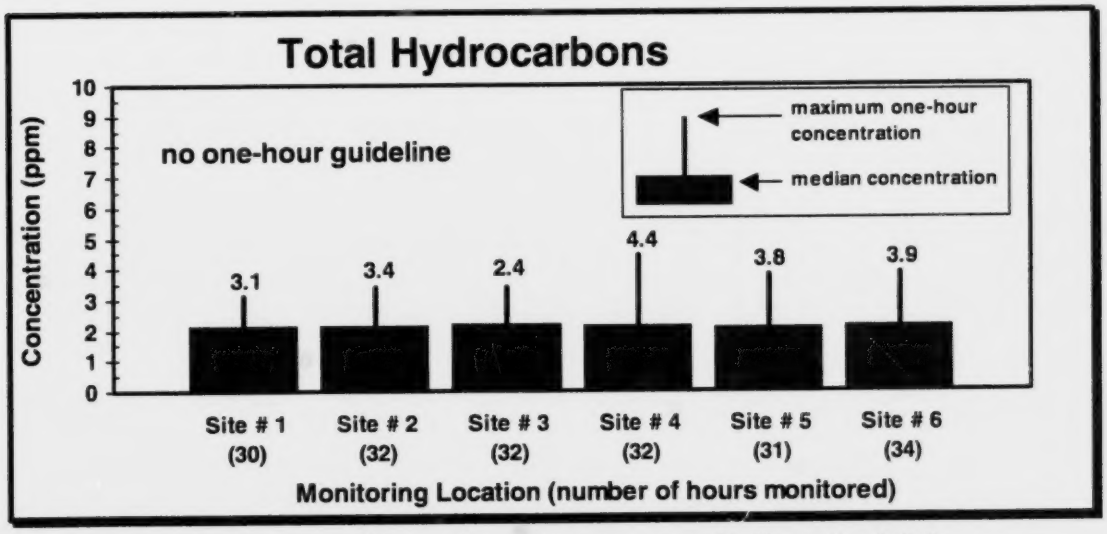

Figure 1.5 One-hour median and maximum concentrations for total hydrocarbons.

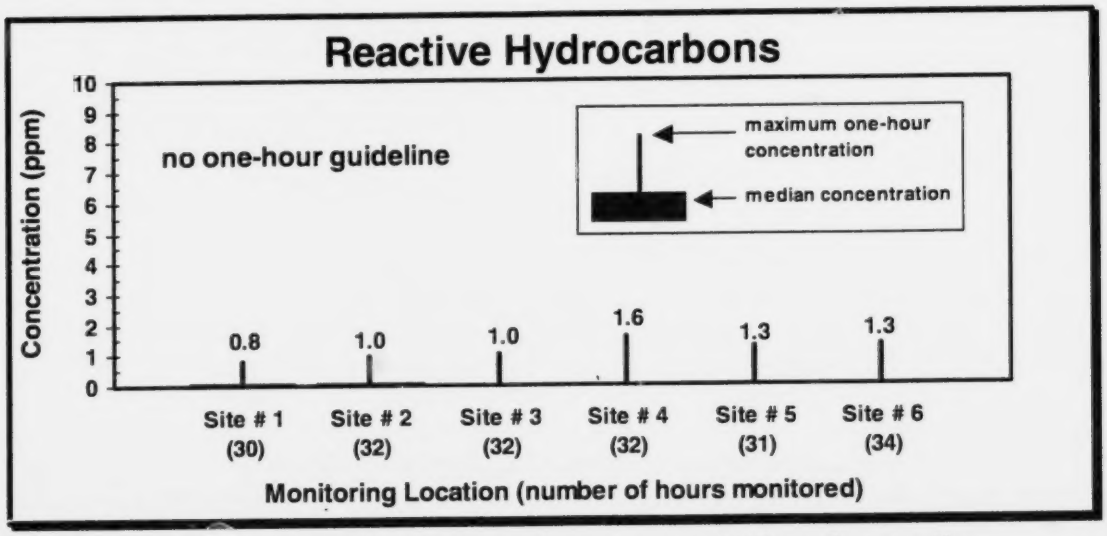

Figure 1.6 One-hour median and maximum concentrations for reactive hydrocarbons.

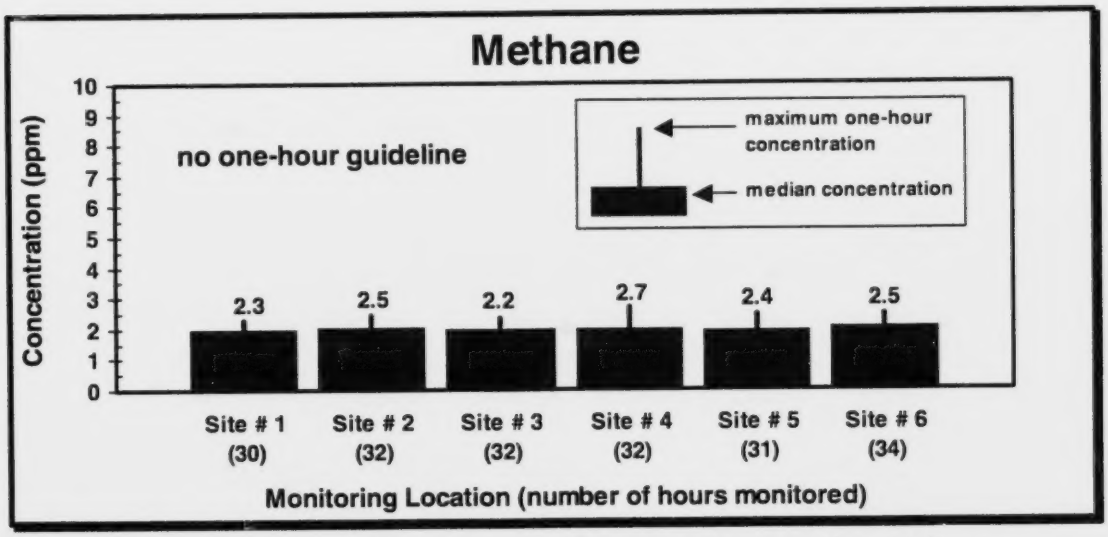

Figure 1.7 One-hour median and maximum concentrations for methane.

Particulates (TSP, PM_{10} and $PM_{2.5}$)

maximum one-hour concentration recorded during survey	one-hour guideline
TSP = 459 µg/m^3	no guideline
PM_{10} = 239 µg/m^3	no guideline
$PM_{2.5}$ = 37 µg/m^3	no guideline

Total suspended particulates (TSP) refer to all particles up to 500 microns in diameter (a human hair is about 70 microns in diameter) and are important primarily from a nuisance perspective. Particles less than 10 micrometres in diameter (PM_{10}) can be inhaled into the nose and throat while smaller particles, less than 2.5 micrometres in diameter ($PM_{2.5}$), can penetrate into the lungs. Sources of particulates include soil dust, road dust, agricultural dust (e.g., harvest), smoke from forest fires and recreational wood burning, vehicle exhaust emissions, brake and tire wear, and industrial emissions. Smaller particles ($PM_{2.5}$) originate in the atmosphere because of condensation and combustion from sources such as vehicle exhaust emissions, industrial emissions and wood burning.

The highest TSP and PM_{10} levels were measured at Site #3 (Lynwood) from 5:23 p.m. to 6:22 p.m. on October 26, 2000. High large particulate levels at this site were likely caused by traffic from Whitemud Drive. Maximum TSP concentrations during other mobile monitoring surveys in the province ranged from 52 µg/m^3 (Caroline/Sundre area) to over 2000 µg/m^3 (Bow Corridor and County of Grande Prairie). Elevated large particulate levels at rural locations are usually caused by road dust from unpaved roads.

The highest concentration of fine particulates ($PM_{2.5}$) was measured at Site #5a (Lymburn) on May 24, 2001 (11:42 a.m. to 12:42 p.m.) with a value of 37 µg/m^3. The MAML operator noted smoky conditions (from the Chisholm fire, 150 km north-northwest of Edmonton) at most monitoring locations on May 24. Maximum one-hour $PM_{2.5}$ concentrations were higher than 250 µg/m^3 at permanent Edmonton monitoring stations on May 24. The forest fire smoke situation on May 24 prompted Capital Health to issue an air quality advisory for the Edmonton area.

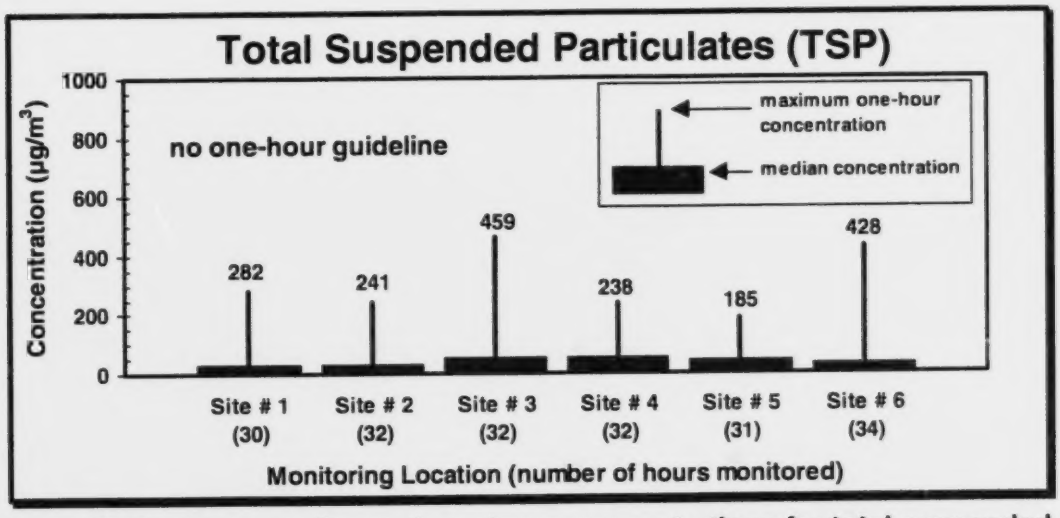

Figure 1.8 One-hour median and maximum concentrations for total suspended particulates (TSP).

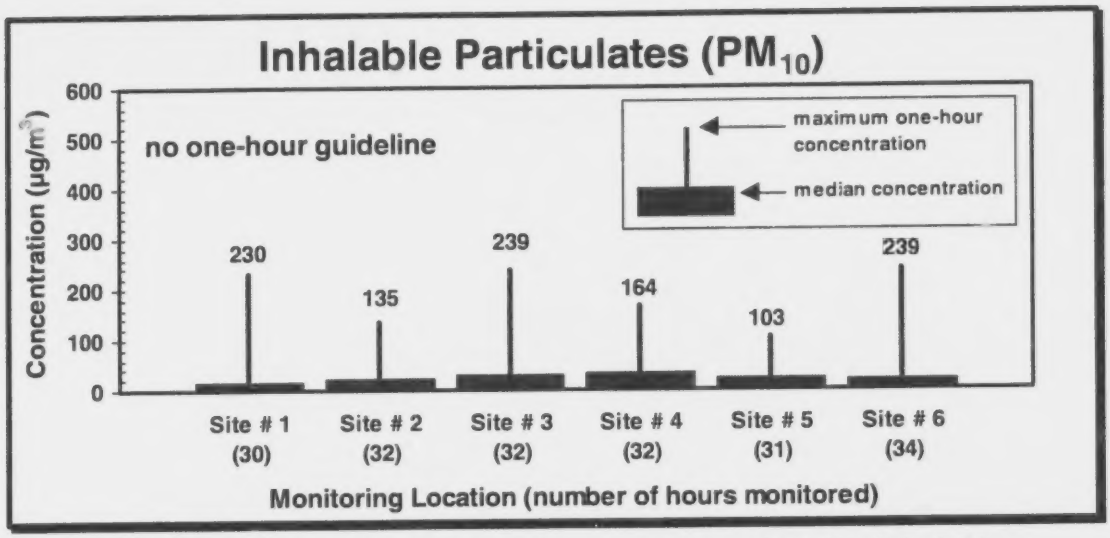

Figure 1.9 One-hour median and maximum concentrations for inhalable particulates (PM_{10}).

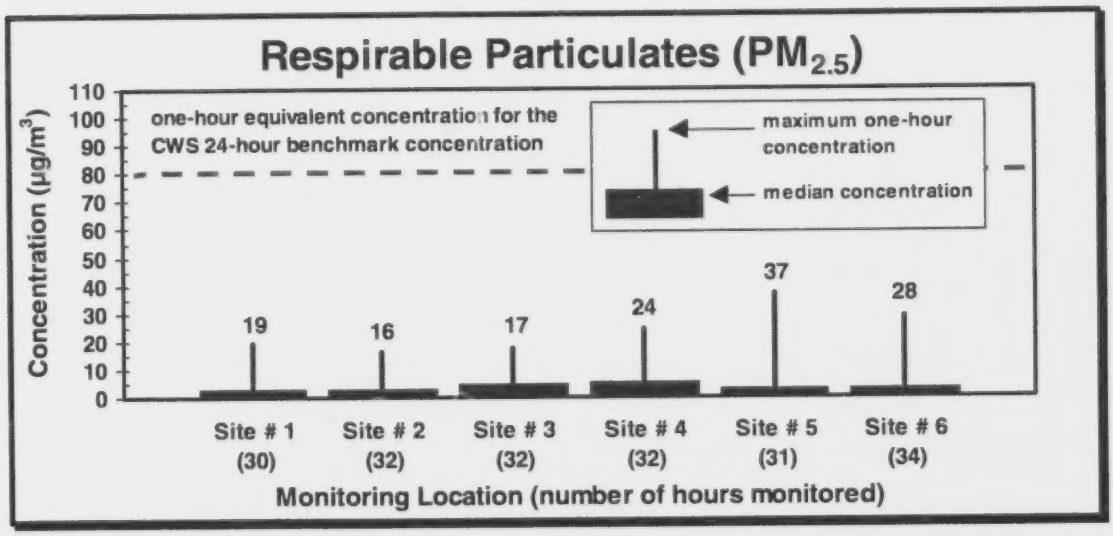

Figure 1.10 One-hour median and maximum concentrations for respirable particulates ($PM_{2.5}$).

Ozone (O_3)

maximum one-hour concentration recorded during survey	one-hour guideline
0.059 ppm	0.082 ppm (based on reduction of lung function and effects on tomatoes)

Ozone in the lower atmosphere is produced by the reaction of oxides of nitrogen and volatile organic compounds in the presence of sunlight, and transport of O_3 from the upper atmosphere to ground level. Transport from the upper atmosphere is likely the dominant ozone producing process in the fall, winter and early spring seasons. O_3 concentrations are generally lower in urban centres due to the destruction of O_3 by nitric oxide.

O_3 levels followed the typical daily and seasonal variations that are observed at other urban monitoring locations in Alberta. The highest concentration was measured at Site #5a (Lymburn) on May 24, 2001 (11:42 a.m. to 12:42 p.m.). The O_3 concentration measured at this time (0.059 ppm) was 72 per cent of the one-hour guideline of 0.082 ppm. The forest fire smoke transported into Edmonton from the Chisholm fire may have influenced O_3 levels on May 24. Maximum one-hour O_3 concentrations for the same time period at the Edmonton Central, Northwest and East stations were 0.047, 0.057 and 0.061 ppm, respectively.

Median O_3 concentrations in the Whitemud Drive area ranged from 0.016 ppm at Site #3 (Lynwood and Rio Terrace) to 0.025 ppm at Site #5 (Aldergrove and Lymburn). The median O_3 concentration for the entire Whitemud Drive survey was 0.019 ppm. Median O_3 levels at permanent Edmonton monitoring stations for the same time period ranged from 0.017 ppm (Edmonton Central) to 0.026 ppm (Edmonton East).

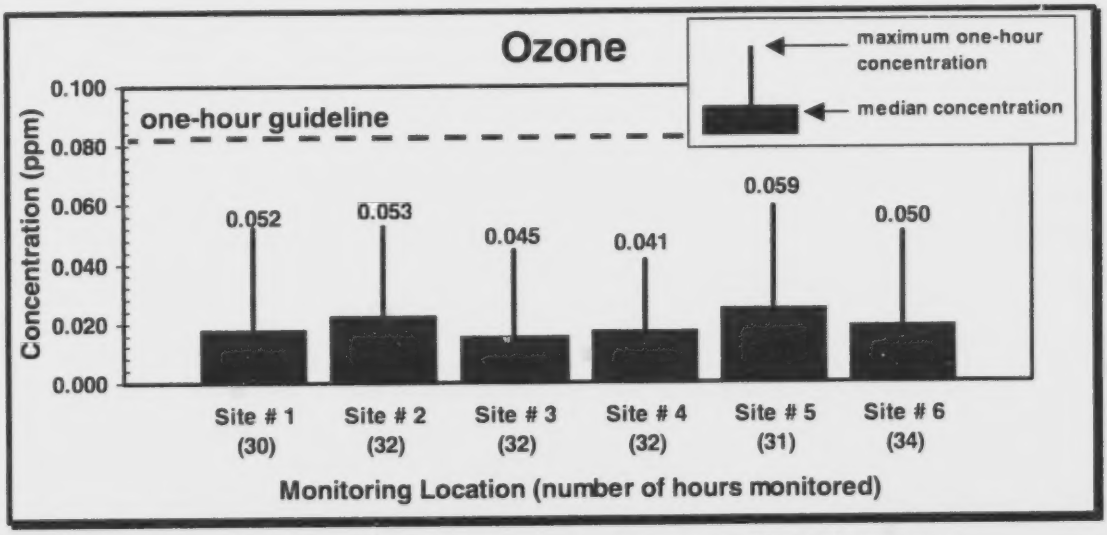

Figure 1.11 One-hour median and maximum concentrations for ozone.

Polycyclic Aromatic Hydrocarbons (PAHs)

maximum one-hour concentration recorded during survey	one-hour guideline
77 ng/m^3	no guideline

Polycyclic aromatic hydrocarbons (PAHs) are a class of chemicals that are usually contained in soot and smoke. There are more than 100 different PAHs with varying levels of toxicity. They are formed during the incomplete combustion of gasoline, diesel, oil, coal, wood, garbage or other organic substances. Tobacco smoke and charbroiled meats are common sources of PAHs. Other outdoor PAH sources include vehicle exhaust emissions, wood smoke from fireplaces, smoke from forest fires and industrial facilities. PAHs occur in the atmosphere in the vapour phase or attached to dust particles. The PAH monitoring instrument aboard the MAML will analyze only particulate bound PAHs.

The highest one-hour PAH concentration was recorded at Site #3a (Rio Terrace) from 4:23 p.m. to 5:29 p.m. on November 14, 2000 (77 ng/m^3 or nanograms per cubic metre). Maximum one-hour PAH concentrations from other mobile monitoring surveys ranged from 11 ng/m^3 in the Lethbridge area (Picture Butte/Sterling) survey to 113 ng/m^3 in the Whitecourt area survey. There are no one-hour guidelines for total PAHs in Alberta or in other jurisdictions in North America.

The overall median PAH concentration at all sites in the Whitemud Drive area survey was 8 ng/m^3. Median PAH concentrations during other mobile surveys in Alberta ranged from 1 to 5 ng/m^3. Higher PAH levels measured during the Whitemud Drive area survey were likely due to exhaust emissions from local traffic and traffic on Whitemud Drive. PAHs are not monitored as a one-hour concentration at permanent monitoring stations in Edmonton. Therefore, PAH levels measured in the Whitemud Drive area survey cannot be compared to other parts of the city.

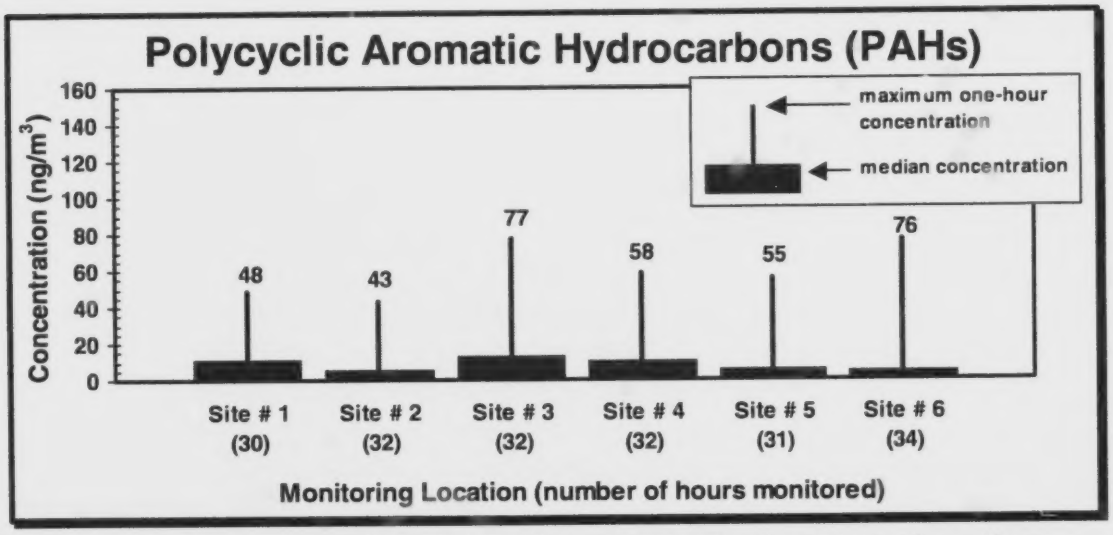

Figure 1.12 One-hour median and maximum concentrations for polycyclic aromatic hydrocarbons.

Sulphur Dioxide (SO_2)

maximum one-hour concentration recorded during survey	one-hour guideline
0.015 ppm	0.172 ppm (based on taste, odour perception and effects on bluegrass)

Sulphur dioxide (SO_2) is a colourless gas with a pungent odour. In Alberta, it is estimated that 45 per cent of SO_2 emissions are produced by natural gas processing plants while oil sands and power plants produce about 26 per cent and 21 per cent of SO_2 emissions, respectively[2]. Other sources include gas plant flares, oil refineries, pulp and paper mills and fertilizer plants.

SO_2 levels were below Alberta's one-hour guideline at all sites monitored during the Whitemud Drive area survey. The maximum one-hour concentration of 0.015 ppm was measured at Site # 6b (Laurier Heights) from 12:25 p.m. to 1:25 p.m. on February 27, 2001. This value is 9% of the one-hour guideline for SO_2. Maximum SO_2 levels at the remaining monitoring sites were 0.012 ppm or lower. The maximum one-hour SO_2 concentration at the Edmonton East station for the same time period was 0.011 ppm.

The overall median SO_2 concentration measured during the entire Whitemud Drive area survey was 0.002 ppm. The median concentration at the Edmonton East station was also 0.002 ppm for the same time period. SO_2 is not routinely monitored at other permanent monitoring stations in Edmonton.

[2] Environment Canada. 1998. *1995 Criteria Air Contaminant Emissions Inventory Summaries.* Pollution Data Branch, Environment Canada.

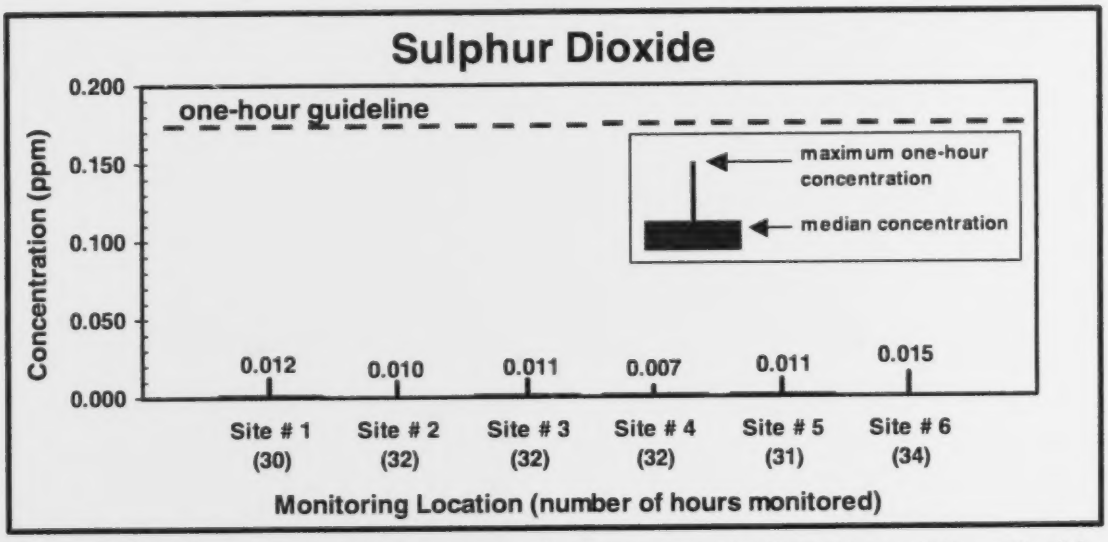

Figure 1.13 One-hour median and maximum concentrations for sulphur dioxide.

Hydrogen Sulphide and Total Reduced Sulphur (H_2S and TRS)

maximum one-hour concentration recorded during survey	one-hour guideline
H_2S = 0.003 ppm	0.010 ppm (based on odour perception)
TRS = 0.005 ppm	no guideline

Hydrogen sulphide (H_2S) is a colourless gas with a rotten egg odour. Total reduced sulphur (TRS) includes hydrogen sulphide, mercaptans, dimethyl sulphide, dimethyl disulphide and other sulphur compounds. Sulphur dioxide is not included in the determination of TRS. Industrial sources of H_2S and TRS include fugitive emissions (leakages) from petroleum refineries, tank farms for unrefined petroleum products, natural gas plants, petrochemical plants, oil sands plants, sewage treatment facilities, pulp and paper plants that use the Kraft pulping process, and animal feedlots. Natural sources of H_2S include sulphur hot springs, sloughs, swamps and lakes.

H_2S concentrations were below Alberta's one-hour air quality guideline at all locations monitored during the survey. The maximum one-hour H_2S (0.003 ppm) concentration was measured at Site #5 (Aldergrove) on January 10, 2001 from 8:07 p.m. to 9:06 p.m. This value is 30 per cent of the one-hour guideline for H_2S (0.010 ppm). The maximum H_2S concentration at the Edmonton East station for the same time period was 0.008 ppm. The maximum one-hour TRS concentration (0.005 ppm) was recorded at Site #5 (Aldergrove) on April 18, 2001 from 11:34 a.m. to 12:33 p.m. TRS is not routinely monitored at permanent monitoring stations in Edmonton.

The median H_2S concentration at all sites monitored during the Whitemud Drive area survey was 0.000 ppm. The median at the Edmonton East monitoring station for the same time period was also 0.000 ppm.

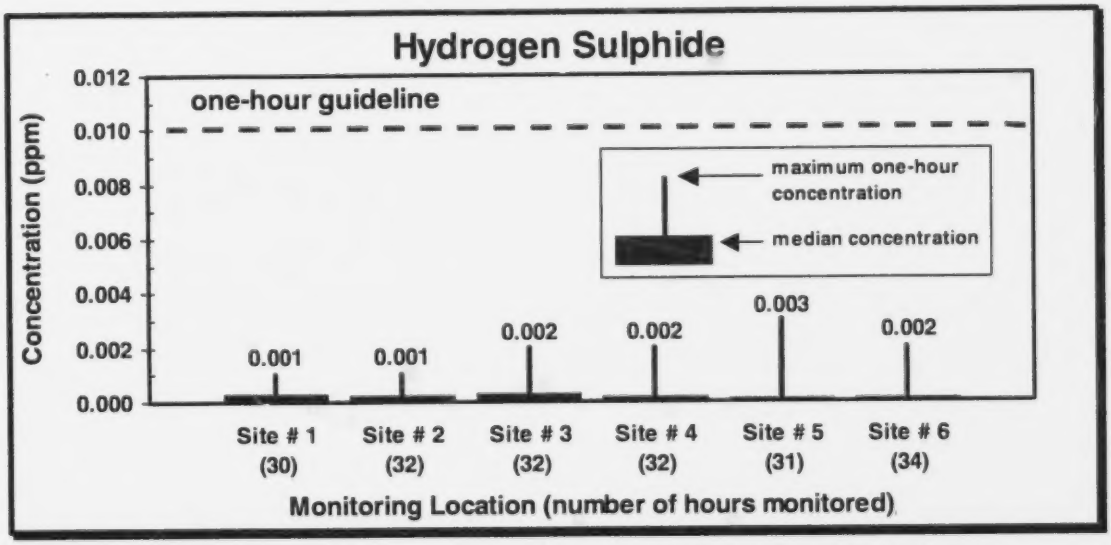

Figure 1.14 One-hour median and maximum concentrations for hydrogen sulphide.

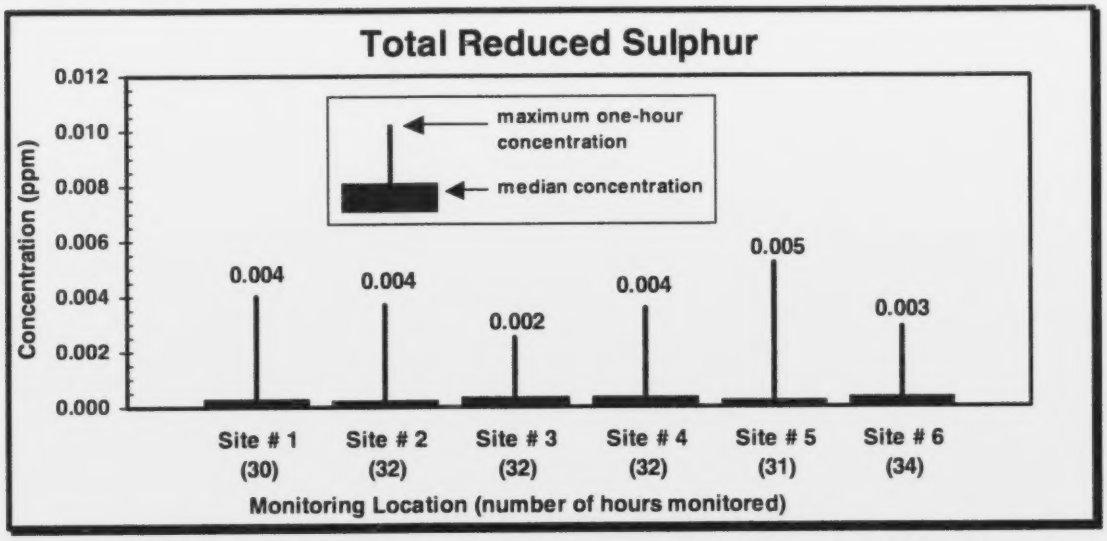

Figure 1.15 One-hour median and maximum concentrations for total reduced sulphur.

Ammonia (NH_3)

maximum one-hour concentration recorded during survey	one-hour guideline
0.039 ppm	2.0 ppm (based on odour perception)

Ammonia is a colourless gas with the well-known pungent odour found in household cleaners. NH_3 is produced both by natural and man-made sources. Some natural sources of NH_3 include the decay of plant material and animal waste. A small portion is also released during respiration. In Alberta, the fertilizer industry is the main industrial source of NH_3. The industry produces synthetic NH_3 for either direct application to soil as a fertilizer, or as a raw material for use in the production of other high nitrogen fertilizer products. The other major source of NH_3 is commercial feedlots, specifically from their large amounts of animal waste.

NH_3 levels in the Whitemud Drive area survey were very low at all monitoring sites. The highest one-hour average NH_3 concentration detected during the survey (0.039 ppm) was measured at Site #3a (Rio Terrace) on May 24, 2001 (9:24 a.m. to 10:24 a.m.). This value is less than 2 per cent of the one-hour guideline for NH_3. The next highest one-hour average NH_3 concentration (0.024 ppm) was also detected on May 24, 2001 (11:42 a.m. to 12:42 p.m.) at Site #5a (Lymburn). Maximum one-hour NH_3 levels during other mobile monitoring surveys in the province ranged from 0.013 ppm (Whitecourt-Swan Hills area) to 1.364 ppm (north of Lethbridge). NH_3 levels on May 24, 2001 may have been influenced by smoke from the Chisholm forest fire.

Median ammonia levels at all sites ranged from 0.001 to 0.003 ppm. The overall median NH_3 level for the entire survey was 0.003 ppm. Median ammonia concentrations

at other mobile air quality surveys conducted in Alberta ranged from 0.003 ppm (Medicine Hat) to 0.075 ppm (north of Lethbridge). Alberta Environment does not continuously monitor NH_3 in Edmonton.

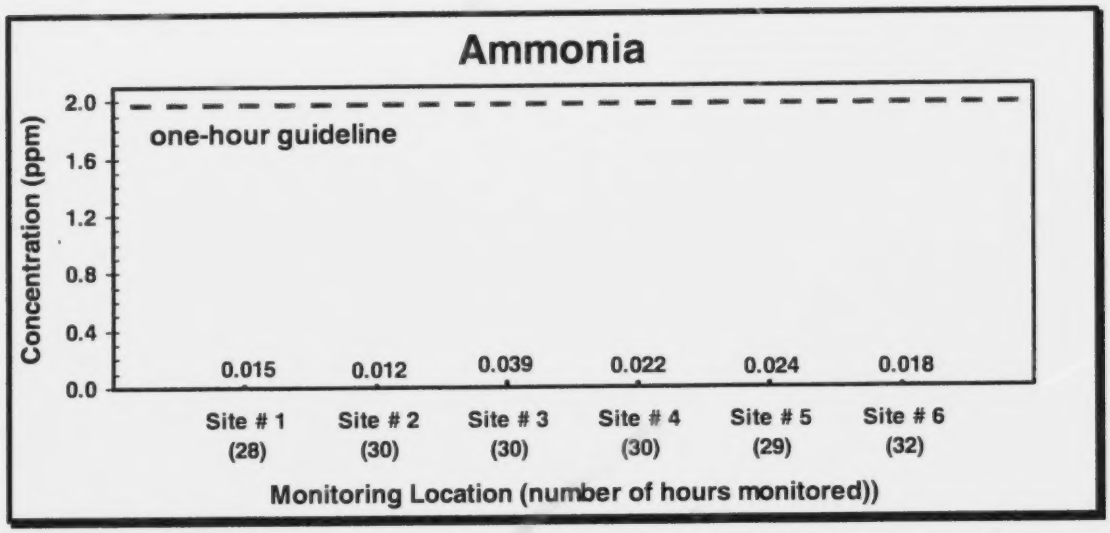

Figure 1.16 One-hour median and maximum concentrations for ammonia.

Part 2: Monitoring for Volatile Organic Compounds

Volatile organic compounds (VOCs) include a large group of chemicals containing carbon and hydrogen atoms that can react quickly to form other chemicals in the atmosphere. They are important because they can present a health risk to humans, animals and vegetation. VOCs can also react with oxides of nitrogen (NO_x) to form ozone (O_3), a health hazard and major contributor to smog.

Major sources of VOCs in the outdoor environment include automobile emissions, gasoline marketing and storage tanks, petroleum and chemical industries, and natural gas combustion. Other sources of VOCs include the evaporation of solvents as well as leaking valves, flanges, pumps and compressors at industrial facilities. VOCs are also contained in incinerator and flare stack emissions associated with the oil and gas industry. The VOCs monitored in the Whitemud Drive area survey were benzene, toluene, ethylbenzene and xylenes, often referred to as BTEX compounds.

Benzene

Benzene is a colourless gas with a sweet odour. It is a known cancer causing substance if exposed to high concentrations for a prolonged period of time. Benzene is recognized as a chemical "concluded to be toxic" on the Environment Canada First Priority Substances List (PSL1).[3] It is ranked fifth on the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) list of hazardous substances.[4] Major sources of benzene include vehicle exhaust, automobile service stations and industrial emissions. Common indoor sources of benzene include cigarette smoke, glues, paint, furniture wax and detergents.

Toluene

Toluene is a colourless gas with a distinctive sweet and pungent odour. It is produced during activities such as gas processing and contained in paints, paint thinners, fingernail polish, lacquers and adhesives. Vehicle exhaust is also a major source of toluene. Toluene has been recognized on the PSL1 list as a chemical "not concluded to be toxic". Toluene is ranked 62nd on the ATSDR list of hazardous substances.

Ethylbenzene

Ethylbenzene is a colourless gas with a distinctive aromatic odour. It is used in the manufacturing of styrene, plastics, synthetic rubber and latex products. Ethylbenzene is also used as a solvent and is a component of gasoline. The toxicity of ethylbenzene is being considered on the Environment Canada Second Priority Substances List (PSL2).[3] Ethylbenzene is ranked 87th on the ATSDR list of hazardous substances.

Xylenes

Total xylenes include m-, p- and o-xylenes. Xylenes are colourless and have a sweet odour when emitted into the atmosphere. Xylenes are used in solvents, cleaning agents, paint thinner, paints and varnishes. Gasoline and forest fires also produce xylenes. Xylenes are recognized as chemicals "not concluded to be toxic" on the PSL1 list. Xylenes are ranked 48th on the ATSDR list of hazardous substances.

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[3] Environment Canada. 1995. *Report of the Ministers' Expert Advisory Panel on the second priority substances list under the Canadian Environmental Protection Act (CEPA).* PSL2 Secretariat, Environment Canada, Hull, Quebec.

[4] Agency for Toxic Substances and Disease Registry. *1999 CERCLA List of Priority Hazardous Substances.* http://www.atsdr.cdc.gov/99list.html.

Monitoring Method

A total of 32 VOC samples were collected at seven locations during the Whitemud Drive area survey (see map on page four). The samples were collected for one-hour periods at the following monitoring sites:

Site #1b (Brander Gardens Park) – three samples;
Site #2 (John Janzen Nature Centre parking lot next to freeway) – six samples;
Site #2a (Fox Drive on approach to Fort Edmonton) – three samples;
Site #3 (Lynwood) – seven samples;
Site #3a (Rio Terrace) – five samples;
Site #4 (Elmwood) – seven samples; and
Site #5a (Lymburn) – one sample.

One-hour samples were collected so that a direct comparison could be made to Alberta's one-hour guideline for benzene and Ontario's Point of Impingement Limits and Air Quality Standards for toluene, ethylbenzene and total xylenes (see Table 2.1). Samples were usually collected during the morning or traffic rush hours.

VOC samples were collected using the Carbotrap 400 adsorbent tube method. This method uses a pump that requires only battery power and therefore is relatively inexpensive and easy to operate in the field.

The Carbotrap 400 tube consists of a glass tube 10.6 cm long with a 0.4 cm inside diameter coated internally with an adsorbent media called Carbotrap. Air is passed through this tube at a low flow rate (about 50 to 100 cm^3/min) for a defined period of time (e.g. one hour). The Carbotrap is specifically formulated to adsorb a number of different hydrocarbon species. Then the tube undergoes laboratory analysis by gas chromatography/mass spectroscopy to quantify ambient concentrations of the hydrocarbons of interest. This monitoring method conforms to the U.S. Environmental Protection Agency (EPA) Compendium Method TO-17.[5] Carbotrap tubes were analyzed for benzene, toluene, ethylbenzene and xylenes.

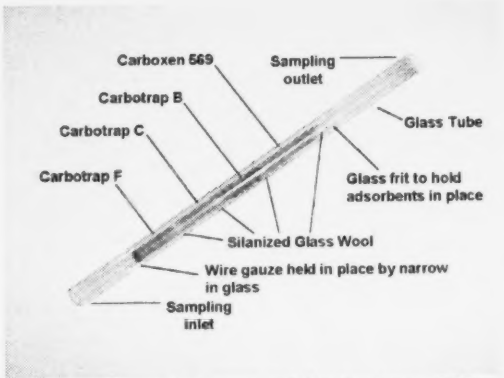


Figure 2.1 Diagram of Carbotrap 400 adsorbent tube.

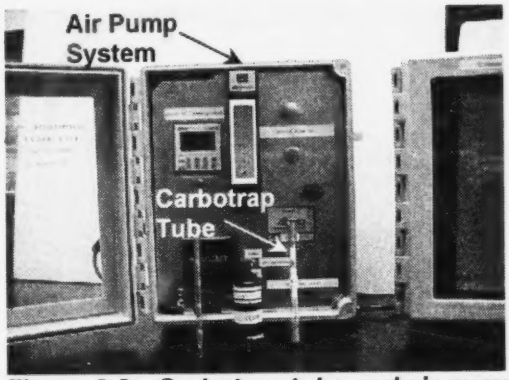


Figure 2.2 Carbotrap tube and air pump system.

[5] U.S. Environmental Protection Agency. 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air: Second Edition. Compendium Method TO-17: Determination of Volatile Organic Compounds in Ambient Air Using Active Sampling Onto Sorbent Tubes.* EPA/625/R-96/010b.

Table 2.1 Air quality guidelines, point of impingement limits and odour thresholds for benzene, toluene, ethylbenzene and total xylenes ($\mu g/m^3$).

	Benzene	Toluene	Ethylbenzene	Xylenes
Alberta Ambient Air Quality Guideline (one-hour)	30	n/a	n/a	n/a
Ontario Point of Impingement Limit (half-hour)	n/a	2000	3000	2300
Odour Threshold (from Ruth, 1986)	4500	8025	8700	348

Air Quality Guidelines

The Alberta ambient air quality guideline for one-hour benzene concentrations is 30 $\mu g/m^3$ (micrograms of benzene per cubic meter of air). This guideline was developed based on the eight-hour occupational exposure limit divided by a safety factor of 100. Therefore, benzene concentrations higher than the Alberta one-hour ambient guideline will not necessarily cause negative effects to human or environmental health. This guideline is intended to provide an early warning of potential health impacts if these levels persist over an extended time period. Benzene can be detected as an odour at concentrations of about 4500 $\mu g/m^3$.[6]

Alberta does not have ambient air quality guidelines for toluene, ethylbenzene or xylenes. However, Ontario has half-hour air quality Point of Impingement Limits for these chemicals. The half-hour Point of Impingement Limits for toluene, ethylbenzene and xylenes in Ontario are 2000, 3000 and 2300 $\mu g/m^3$, respectively.[7] Odour thresholds for toluene, ethylbenzene, and xylenes are 8025, 8700 $\mu g/m^3$ and 348 $\mu g/m^3$, respectively.

[6] Ruth, J.H. 1986. *Odor thresholds and irritation levels of several chemical substances: a review.* Am. Ind. Hyg. Assoc. J 47: pp. A-142 to A-151.

[7] Ontario Ministry of the Environment. 1994. *Summary of Point of Impingement Standards, Point of Impingement Guidelines, and Ambient Air Quality Criteria (AAQCs).* Standards Development Branch.

Results

Concentrations of toluene, ethylbenzene and xylenes were well below Ontario's Point of Impingement Limits in all samples collected in the Whitemud Drive area survey. Benzene concentrations were below Alberta's one-hour guideline in all but one sample.

The Alberta one-hour guideline for benzene was exceeded at Site #4 (Elmwood - 164th Street and 80th Avenue) on June 13, 2001 (6:49 a.m. to 7:56 a.m.). This sample was collected about 100 m from Whitemud Drive during the morning rush hour traffic. The benzene concentration in this sample was 35 $\mu g/m^3$ compared to the one-hour guideline of 30 $\mu g/m^3$. The air quality technologist reported very light wind conditions when this sample was collected. This exceedance may have been due to traffic on Whitemud Drive. Concentrations of toluene, ethylbenzene and xylenes in this sample were very low (below the analytical detection limit).

The next highest benzene concentration (13 $\mu g/m^3$) was measured on November 30, 2000 (7:48 a.m. to 8:49 a.m.) at Site #2 (John Janzen Nature Centre parking lot). The benzene concentration measured at this location was less than half of Alberta's one-hour guideline. Concentrations of toluene (22 $\mu g/m^3$) and xylenes (13 $\mu g/m^3$) were slightly elevated during this time period. The air quality technologist noted very slow

moving traffic on Quesnell Bridge when this sample was collected.

The highest toluene and ethylbenzene concentrations were measured at Site #2 (John Janzen Nature Centre parking lot) on November 30, 2000 (7:48 a.m. to 8:49 a.m.) for toluene and February 13, 2001 (7:40 a.m. to 8:44 a.m.) for ethylbenzene. The toluene (22 $\mu g/m^3$) and ethylbenzene (17 $\mu g/m^3$) concentrations in these samples were very low compared to the Ontario half-hour Point of Impingement Limits of 2000 and 3000 $\mu g/m^3$, respectively.

The maximum concentration of xylenes was measured on November 14, 2000 (4:23 p.m. to 5:23 p.m.) at Site #3a (Rio Terrace). The concentration of xylenes in this sample (22 $\mu g/m^3$) was very low compared to the Ontario half-hour Point of Impingement Limit of 2300 $\mu g/m^3$.

Maximum concentrations of benzene (35 $\mu g/m^3$), toluene (22 $\mu g/m^3$), ethylbenzene (17 $\mu g/m^3$) and xylenes (22 $\mu g/m^3$) were much lower than their respective odour thresholds. The odour thresholds for these chemicals are 4500, 8025, 8700 and 348 $\mu g/m^3$, respectively.

Concentrations of VOCs measured in samples collected near Whitemud Drive are presented in Figures 2.3 and 2.4 and Table 2.2.

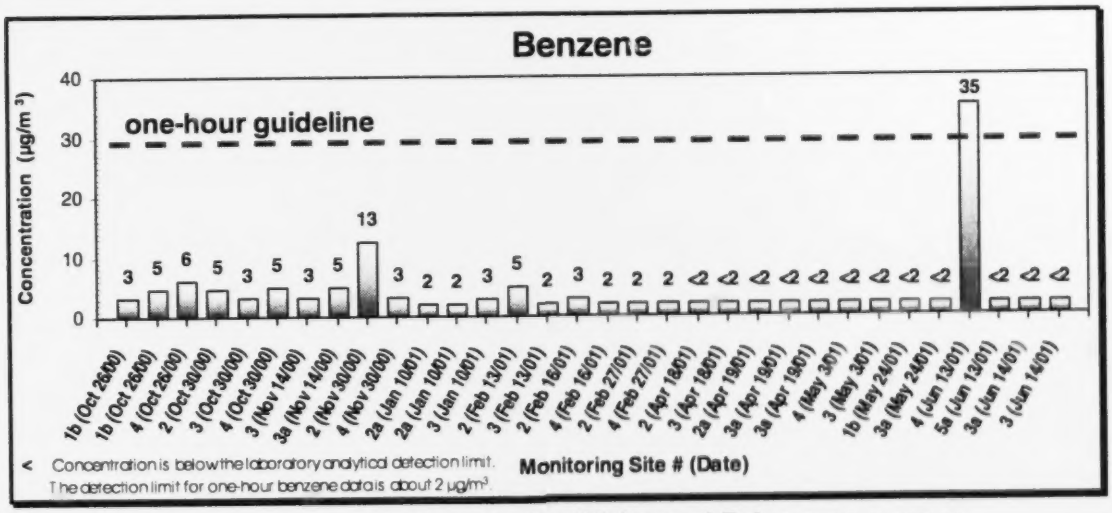
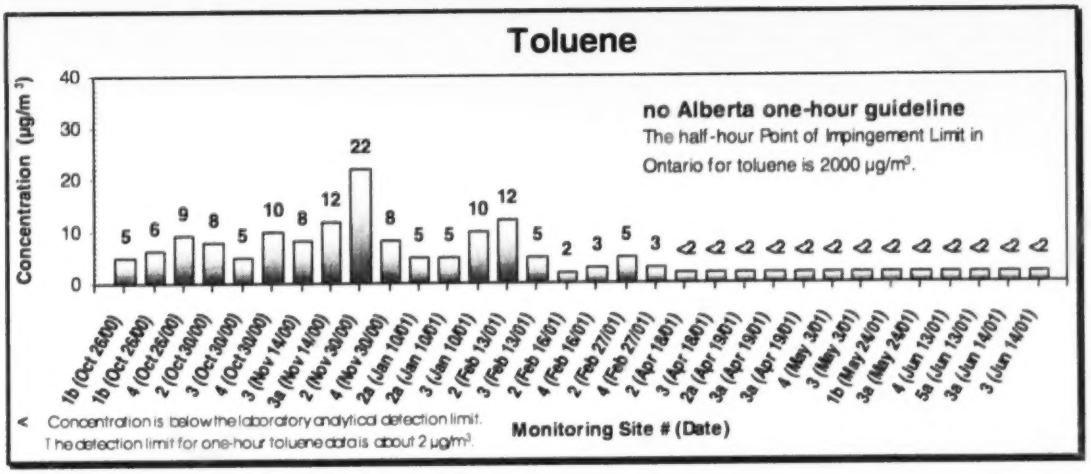
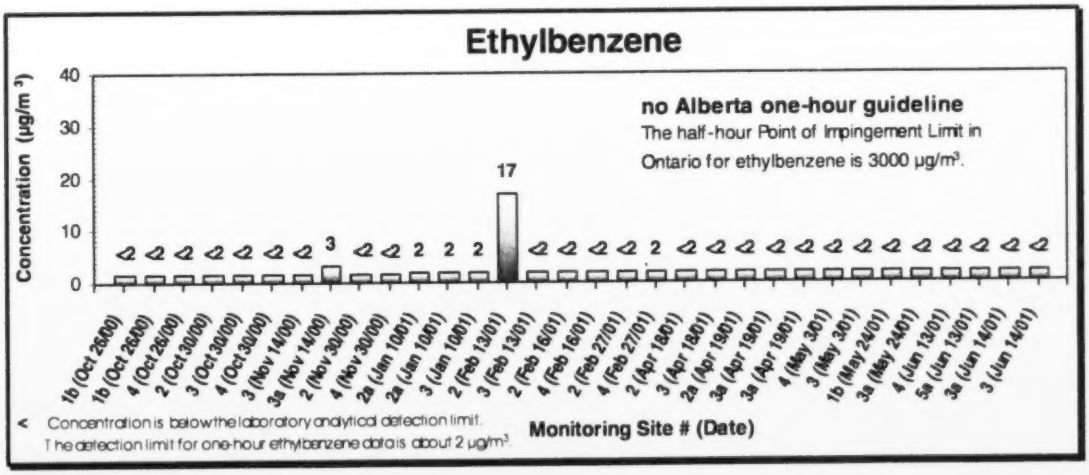


Figure 2.3 Benzene concentrations in the Whitemud Drive area survey.


Toluene
Concentration (µg/m³)
no Alberta one-hour guideline
The half-hour Point of Impingement Limit in Ontario for toluene is 2000 µg/m³.
< Concentration is below the laboratory analytical detection limit.
The detection limit for one-hour toluene data is about 2 µg/m³.
Monitoring Site # (Date)


Ethylbenzene
Concentration (µg/m³)
no Alberta one-hour guideline
The half-hour Point of Impingement Limit in Ontario for ethylbenzene is 3000 µg/m³.
< Concentration is below the laboratory analytical detection limit.
The detection limit for one-hour ethylbenzene data is about 2 µg/m³.
Monitoring Site # (Date)

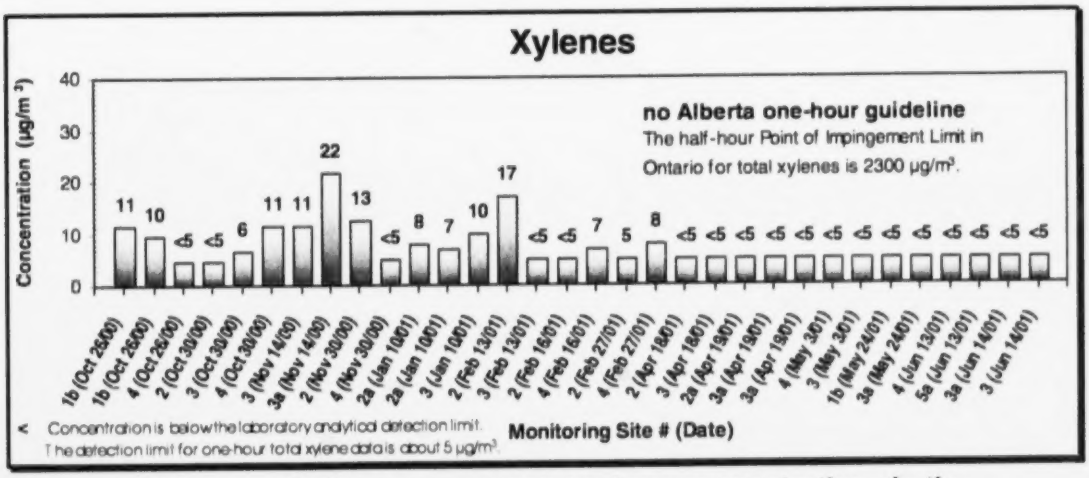

Xylenes
Concentration (µg/m³)
no Alberta one-hour guideline
The half-hour Point of Impingement Limit in Ontario for total xylenes is 2300 µg/m³.
< Concentration is below the laboratory analytical detection limit.
The detection limit for one-hour total xylene data is about 5 µg/m³.
Monitoring Site # (Date)

Figure 2.4 Toluene, ethylbenzene and total xylene concentrations in the Whitemud Drive area survey.

Table 2.2 Benzene, toluene, ethylbenzene and total xylene concentrations in the Whitemud Drive area survey.

Site #	Date	Sampling Time	Sampling Location	Benzene	Toluene	Ethylbenzene	Xylenes	Operator Comments
				µg/m³	µg/m³	µg/m³	µg/m³	
1b	26-Oct-00	6:42 a.m. to 7:44 a.m.	Brander Gardens	3	5	<2	11	
1b	26-Oct-00	6:42 a.m. to 7:44 a.m.	Brander Gardens	5	6	<2	10	Duplicate sample.
4	26-Oct-00	2:46 p.m. to 3:47 p.m.	Elmwood	6	9	<2	<5	
2	30-Oct-00	7:53 a.m. to 8:55 a.m.	John Janzen Nature Centre	5	8	<2	<5	
3	30-Oct-00	4:15 p.m. to 5:15 p.m.	Lynnwood	3	5	<2	6	Atmosphere looks hazy. Some exhaust drifting in from Whitemud Drive.
4	30-Oct-00	6:54 p.m. to 7:54 p.m.	Elmwood	5	10	<2	11	
3	14-Nov-00	7:49 a.m. to 8:49 a.m.	Lynnwood	3	8	<2	11	
3a	14-Nov-00	4:23 p.m. to 5:23 p.m.	Rio Terrace	5	12	3	22	
2	30-Nov-00	7:48 a.m. to 8:49 a.m.	John Janzen Nature Centre	13	22	<2	13	Traffic crawling on Quesnell Bridge (snowing - ESE wind).
4	30-Nov-00	5:13 p.m. to 6:13 p.m.	Elmwood	3	8	<2	<5	Light snow.
2a	10-Jan-01	7:58 a.m. to 9:09 a.m.	Fox Dr on approach rd to Ft Edm	2	5	2	8	Normal traffic movement.
2a	10-Jan-01	7:58 a.m. to 9:09 a.m.	Fox Dr on approach rd to Ft Edm	2	5	2	7	Duplicate sample.
3	10-Jan-01	4:17 p.m. to 5:26 p.m.	Lynnwood	3	10	2	10	
2	13-Feb-01	7:40 a.m. to 8:44 a.m.	John Janzen Nature Centre	5	12	17	17	Wind shifted from SE to SW during sample period - brought wind across the parking lot instead of Whitemud Drive.
3	13-Feb-01	5:08 p.m to 6:13 p.m.	Lynnwood	2	5	<2	<5	
2	16-Feb-01	7:45 a.m. to 8:54 a.m.	John Janzen Nature Centre	3	2	<2	<5	Normal traffic movement.
4	16-Feb-01	5:52 p.m. to 6:56 p.m.	Elmwood	2	3	<2	7	
2	27-Feb-01	7:47 a.m. to 8:49 a.m.	John Janzen Nature Centre	2	5	<2	5	Light and variable wind.
4	27-Feb-01	4:59 p.m. to 6:06 p.m.	Elmwood	2	3	2	8	Some exhaust from Whitemud Drive.
2	18-Apr-01	6:39 a.m. to 7:49 a.m.	John Janzen Nature Centre	<2	<2	<2	<5	
3	18-Apr-01	3:04 p.m. to 4:12 p.m.	Lynnwood	<2	<2	<2	<5	
2a	19-Apr-01	7:07 a.m. to 8:08 a.m.	Fox Dr on approach rd to Ft Edm	<2	<2	<2	<5	
3a	19-Apr-01	3:18 p.m. to 4:30 p.m.	Rio Terrace	<2	<2	<2	<5	
3a	19-Apr-01	3:18 p.m. to 4:30 p.m.	Rio Terrace	<2	<2	<2	<5	Duplicate sample.
4	3-May-01	7:10 a.m. to 8:14 a.m.	Elmwood	<2	<2	<2	<5	
3	3-May-01	3:29 p.m. to 4:36 p.m.	Lynnwood	<2	<2	<2	<5	
1b	24-May-01	5:49 a.m. to 6:49 a.m.	Brander Gardens	<2	<2	<2	<5	Elevated readings from Whitemud Drive.
3a	24-May-01	3:20 p.m. to 4:20 p.m.	Rio Terrace	<2	<2	<2	<5	Smoke in air from northern forest fires.
4	13-Jun-01	6:49 a.m. to 7:56 a.m.	Elmwood	35	<2	<2	<5	Winds light and variable.
5a	13-Jun-01	4:10 p.m. to 5:18 p.m.	Lynburn	<2	<2	<2	<5	Light rain.
3a	14-Jun-01	6:48 a.m. to 7:53 a.m.	Rio Terrace	<2	<2	<2	<5	Overcast, light variable wind - elevated readings from Whitemud Drive traffic.
3	14-Jun-01	2:56 p.m. to 4:09 p.m.	Lynnwood	<2	<2	<2	<5	80% overcast and no rain.

Appendix – Data Collected by the Mobile Air Monitoring Laboratory

Table A1: Median one-hour air pollutant levels at each monitoring site in the Whitemud Drive area survey.

Monitoring Location (# of hours sampled)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm												$\mu g/m^3$			ng/m^3
Site # 1 (30)	0.4	0.018	2.2	2.0	0.1	0.002	0.017	0.014	0.034	0.003	0.000	0.000	31	19	3	12
Site # 2 (32)	0.4	0.023	2.2	2.1	0.1	0.001	0.011	0.012	0.025	0.001	0.000	0.000	34	22	3	6
Site # 3 (32)	0.4	0.016	2.2	2.0	0.1	0.002	0.026	0.019	0.045	0.003	0.000	0.000	58	32	5	14
Site # 4 (32)	0.4	0.017	2.2	2.0	0.1	0.002	0.014	0.014	0.028	0.002	0.000	0.000	55	36	5	11
Site # 5 (31)	0.3	0.025	2.1	1.9	0.1	0.002	0.008	0.009	0.018	0.001	0.000	0.000	42	24	3	6
Site # 6 (34)	0.4	0.019	2.1	2.0	0.1	0.001	0.007	0.013	0.020	0.002	0.000	0.000	33	21	3	5
Overall Median	**0.4**	**0.019**	**2.2**	**2.0**	**0.1**	**0.002**	**0.013**	**0.014**	**0.026**	**0.003**	**0.000**	**0.000**	**41**	**24**	**3**	**8**

Table A2: Median one-hour air pollutant levels at Alberta Environment monitoring stations in Edmonton and Calgary for the same monitoring period.

Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm												$\mu g/m^3$			ng/m^3
Whitemud Drive	0.4	0.019	2.2	2.0	0.1	0.002	0.013	0.014	0.026	0.003	0.000	0.000	41	24	3	8
Edmonton Central	0.7	0.017	2.2	no data			0.019	0.023	0.042	no data					8	no data
Edmonton Northwest	0.6	0.022	2.2	no data			0.011	0.02	0.03	no data				28	11	no data
Edmonton East*	0.3	0.026	2.2	no data		0.002	0.006	0.01	0.02	no data		0.000	no data	15	11	no data
Calgary Central	0.7	0.016	2.1	no data			0.019	0.03	0.05	no data				26	10	no data
Calgary Northwest	0.3	0.027	2.1	no data			0.005	0.01	0.02	no data						
Calgary East	0.5	0.020	2.1	no data		0.003	0.027	0.02	0.05	no data		0.001	no data			

* PM_{10} data for Edmonton East is based on data collected in June 2000 only.

Table A3: Median one-hour air pollutant levels during other Alberta Environment air monitoring surveys.

Monitoring Survey (survey period)	CO	O_3	THC	CH_4	RHC	SO_2	NO_2	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAHs
	ppm										$\mu g/m^3$			ng/m^3
Whitemud Drive (Jun 00 to Jun 01)	0.4	0.019	2.2	2.0	0.1	0.002	0.014	0.003	0.000	0.000	41	24	3	8
Edson/Hinton (Sep 99 to Jun 00)	0.1	0.031	1.9	1.8	0.1	0.001	0.004	0.002	0.000	0.001	49	29	4	1
Whitecourt/Swan Hills (Nov 00 to Jun 01)	0.2	0.027	2.3	2.0	0.3	0.004	0.005	0.001	0.001	0.000	47	29	4	1
Bow Corridor (Dec 99 to Sep 00)	0.2	0.030	1.9	1.8	0.1	0.001	0.007	0.001	0.001	0.000	74	40	4	4
County of Grande Prairie (Dec 98 to Oct 99)	0.2	0.036	2.0	1.7	0.2	0.001	0.002	0.001	0.000	0.000	14	9	2	2
Caroline/Sundre (Apr 97 to Apr 98)	0.3	0.042	2.1	1.8	0.2	0.002	0.009	no data	0.000	0.000	4	3	1	no data
Lethbridge (Sep 98 to Jul 99)	0.2	0.046	1.9	1.6	0.2	0.000	0.003	0.005	0.000	0.001	17	11	2	3
Medicine Hat (May 98 to Jan 99)	0.4	0.031	2.1	1.8	0.2	0.001	0.009	0.003	0.000	0.000	16	11	2	5
Picture Butte/Sterling (Sep 98 to Jul 99)	0.2	0.044	2.1	1.8	0.2	0.001	0.002	0.075	0.002	0.001	42	24	3	2

ppm - parts per million

$\mu g/m^3$ - micrograms per cubic metre of air

ng/m^3 - nanograms per cubic metre of air

no data - Indicates that parameter is not monitored or the analyzer was not operational.

Edmonton Central is located at 10255-104 Street
Edmonton Northwest is located at 13335-127 Street
Edmonton East is located at 105 Avenue and 17 Street

Calgary Central is located at 611-4 Street S.W.
Calgary Northwest is located at 39 Street and 29 Avenue N.W.
Calgary East is located at 49 Avenue and 15 Street S.E.

List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A4: Maximum one-hour air pollutant levels at each monitoring site in the Whitemud Drive area survey.

Monitoring Location (# of hours sampled)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm												$\mu g/m^3$			ng/m^3
Site # 1 (30)	0.9	0.052	3.1	2.3	0.8	0.012	0.091	0.031	0.116	0.015	0.004	0.001	282	230	19	48
Site # 2 (32)	1.1	0.053	3.4	2.5	1.0	0.010	0.089	0.032	0.121	0.012	0.004	0.001	241	135	16	43
Site # 3 (32)	1.8	0.045	3.4	2.3	1.0	0.011	0.201	**0.041**	0.243	**0.039**	0.002	0.002	**459**	**239**	17	**77**
Site # 4 (32)	**2.7**	0.041	**4.4**	**2.7**	**1.6**	0.007	0.212	0.038	0.246	0.022	0.004	0.002	238	164	24	58
Site # 5 (31)	1.9	**0.059**	3.8	2.4	1.3	0.011	0.188	0.034	0.220	0.024	**0.005**	**0.003**	185	103	**37**	55
Site # 6 (34)	2.2	0.050	3.9	2.5	1.3	**0.015**	**0.230**	0.036	**0.262**	0.018	0.003	0.002	428	**239**	28	76
One-Hour Maximum	**2.7**	**0.059**	**4.4**	**2.7**	**1.6**	**0.015**	**0.230**	**0.041**	**0.262**	**0.039**	**0.005**	**0.003**	**459**	**239**	**37**	**77**
One-Hour Guideline	**13.0**	**0.082**	n/a	n/a	n/a	**0.172**	n/a	**0.212**	n/a	**2.0**	n/a	**0.010**	n/a	n/a	n/a	n/a

Table A5: Maximum one-hour air pollutant levels at Alberta Environment monitoring stations in Edmonton and Calgary for the same monitoring period.

Monitoring Location	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
	ppm													$\mu g/m^3$		ng/m^3
Whitemud Drive	2.7	0.059	4.4	2.7	1.6	0.015	0.230	0.041	0.262	0.039	0.005	0.003	459	239	37	77
Edmonton Central	4.8	0.047	2.6	no data			0.121	0.057	0.166	no data					275	no data
Edmonton Northwest	9.3	0.057	6.0	no data			0.731	0.073	0.804	no data				304	261	no data
Edmonton East*	2.8	0.061	10.0	no data		0.011	0.266	0.050	0.316	no data		0.008	no data	161	276	no data
Calgary Central	3.6	0.049	2.9	no data			0.283	0.150	0.326	no data				103	35	no data
Calgary Northwest	2.0	0.057	2.8	no data			0.150	0.049	0.174	no data						
Calgary East	4.3	0.053	3.6	no data		0.010	0.357	0.063	0.415	no data		0.010	no data			
One-Hour Guideline	**13.0**	**0.082**	n/a	n/a	n/a	**0.172**	n/a	**0.212**	n/a	**2.0**	n/a	**0.010**	n/a	n/a	n/a	n/a

* PM_{10} data for Edmonton East is based on data collected in June 2000 only.

Table A6: Maximum one-hour air pollutant levels during other Alberta Environment air monitoring surveys.

Monitoring Survey (survey period)	CO	O_3	THC	CH_4	RHC	SO_2	NO_2	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAHs
	ppm										$\mu g/m^3$			ng/m^3
Whitemud Drive (Jun 00 to Jun 01)	2.7	0.059	4.4	2.7	1.6	0.015	0.041	0.039	0.005	0.003	459	239	37	77
Edson/Hinton (Sep 99 to Jun 00)	0.8	0.055	3.0	2.4	0.6	0.023	0.027	0.020	0.024	0.024	515	322	34	38
Whitecourt/Swan Hills (Nov 00 to Jun 01)	0.7	0.054	4.3	2.5	2.5	0.046	0.030	0.013	0.005	0.003	946	441	43	113
Bow Corridor (Dec 99 to Sep 00)	1.1	0.056	7.8	2.2	6.6	0.092	0.031	0.034	0.004	0.002	2082	1094	60	36
County of Grande Prairie (Dec 98 to Oct 99)	1.0	0.064	32.4	6.4	29.4	0.043	0.061	0.030	0.010	0.009	2305	1287	101	35
Caroline/Sundre (Apr 97 to Apr 98)	0.9	0.059	2.9	2.6	0.7	0.043	0.040	no data	0.008	0.008	52	43	17	no data
Lethbridge (Sep 98 to Jul 99)	2.4	0.062	2.2	1.9	0.4	0.007	0.016	0.020	0.001	0.003	405	363	294	21
Medicine Hat (May 98 to Jan 99)	2.8	0.062	2.6	2.3	0.4	0.029	0.080	0.027	0.001	0.004	213	135	12	35
Picture Butte/Sterling (Sep 98 to Jul 99)	1.2	0.059	9.5	7.1	1.6	0.004	0.013	1.364	0.054	0.054	490	298	32	11
One-Hour Guideline	**13.0**	**0.082**	n/a	n/a	n/a	**0.172**	**0.212**	**2.0**	n/a	**0.010**	n/a	n/a	n/a	n/a

ppm - parts per million

$\mu g/m^3$ - micrograms per cubic metre of air

ng/m^3 - nanograms per cubic metre of air

no data - Indicates that parameter is not monitored or the analyzer was not operational.

Edmonton Central is located at 10255-104 Street
Edmonton Northwest is located at 13335-127 Street
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List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A7: One-hour average air pollutant levels in Whitemud Drive area survey (June 2000 and June 2001).

Date	Monitoring Location and Time (MST)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_x	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
		ppm												µg/m³			ng/m³
21-Jun-00	Site # 1 (5:27 a.m. to 6:26 a.m.)	0.2	0.010	2.0	1.9	0.1	0.002	0.019	0.015	0.034	0.003	0.000	0.000	13	9	1	12
	Site # 3 (6:37 a.m. to 7:36 a.m.)	0.3	0.015	1.9	1.8	0.1	0.000	0.007	0.011	0.018	0.002	0.000	0.000	11	7	1	11
	Site # 6A (7:50 a.m. to 8:49 a.m.)	0.2	0.021	1.9	1.8	0.1	0.002	0.001	0.005	0.006	0.001	0.000	0.000	8	5	1	2
	Site # 4A (8:55 a.m. to 9:54 a.m.)	0.2	0.024	1.9	1.8	0.1	0.002	0.002	0.003	0.006	0.001	0.000	0.000	12	7	1	4
	Site # 5 (10:22 a.m. to 11:22 a.m.)	0.2	0.033	1.9	1.8	0.1	0.001	0.001	0.001	0.001	0.001	0.000	0.000	10	6	1	6
	Site # 2 (11:40 a.m. to 12:40 p.m.)	0.2	0.039	2.0	1.8	0.1	0.001	0.001	0.002	0.002	0.001	0.000	0.000	13	7	1	0
	Site # 1 (12:49 p.m. to 2:04 p.m.)	0.4	0.033	1.9	1.8	0.1	0.002	0.014	0.009	0.022	0.004	0.001	0.001	15	9	1	11
	Site # 3A (2:13 p.m. to 3:14 p.m.)	0.4	0.021	1.9	1.8	0.1	0.003	0.038	0.021	0.059	0.004	0.001	0.001	27	15	2	22
	Site # 6A (3:20 p.m. to 4:21 p.m.)	0.1	0.035	1.9	1.8	0.1	0.002	0.005	0.008	0.012	0.002	0.001	0.000	21	11	1	2
	Site # 4A (4:26 p.m. to 5:28 p.m.)	0.1	0.029	1.9	1.8	0.1	0.002	0.010	0.014	0.023	0.002	0.001	0.000	22	12	1	8
	Site # 5A (5:38 p.m. to 6:39 p.m.)	0.1	0.034	1.8	1.8	0.1	0.001	0.006	0.008	0.014	0.001	0.001	0.000	18	10	1	3
	Site # 2 (6:49 p.m. to 7:49 p.m.)	0.2	0.034	1.9	1.8	0.1	0.004	0.008	0.013	0.020	0.003	0.002	0.000	22	12	1	2
22-Jun-00	Site # 4A (5:59 a.m. to 6:57 a.m.)	0.2	0.017	1.9	1.9	0.0	0.001	0.009	0.011	0.020	0.000	0.000	0.000	33	21	2	8
	Site # 3A (7:06 a.m. to 8:05 a.m.)	0.3	0.014	1.9	1.9	0.0	0.003	0.042	0.021	0.062	0.001	0.000	0.000	34	19	2	21
	Site # 6A (8:09 a.m. to 9:08 a.m.)	0.1	0.030	1.8	1.8	0.0	0.001	0.005	0.006	0.011	0.000	0.000	0.000	18	10	1	2
	Site # 5A (9:21 a.m. to 10:20 a.m.)	0.1	0.031	1.8	1.8	0.0	0.000	0.005	0.005	0.010	0.000	0.000	0.000	14	9	1	4
	Site # 2 (10:30 a.m. to 11:30 a.m.)	0.2	0.037	1.9	1.8	0.0	0.000	0.003	0.002	0.005	0.001	0.000	0.000	22	13	1	1
	Site # 1 (11:35 a.m. to 12:36 p.m.)	0.4	0.031	1.9	1.8	0.1	0.001	0.012	0.009	0.020	0.003	0.000	0.000	26	16	2	8
	Site # 4A (12:43 p.m. to 1:43 p.m.)	0.1	0.038	1.9	1.8	0.0	0.002	0.004	0.005	0.007	0.000	0.000	0.000	30	17	2	3
	Site # 3A (1:49 p.m. to 2:50 p.m.)	0.4	0.019	1.9	1.8	0.1	0.006	0.048	0.030	0.078	0.003	0.000	0.001	35	20	3	29
	Site # 6A (3:20 p.m. to 4:21 p.m.)	0.1	0.042	1.8	1.8	0.0	0.002	0.000	0.003	0.003	0.000	0.000	0.000	19	12	1	0
	Site # 5A (4:07 p.m. to 5:09 p.m.)	0.2	0.039	1.9	1.8	0.1	0.003	0.001	0.005	0.005	0.000	0.000	0.000	39	21	2	1
	Site # 2 (5:24 p.m. to 6:24 p.m.)	0.1	0.037	1.9	1.8	0.0	0.002	0.002	0.004	0.006	0.000	0.000	0.000	12	8	1	1
	Site # 1 (6:29 p.m. to 7:31 p.m.)	0.1	0.032	1.8	1.8	0.0	0.002	0.005	0.009	0.014	0.001	0.000	0.000	11	6	1	2
13-Jun-01	Site # 3 (5:39 a.m. to 6:39 a.m.)	0.5	0.004	2.2	2.1	0.1	0.000	0.029	0.017	0.046	0.000	0.000	0.000	14	11	2	17
	Site # 4 (6:49 a.m. to 7:56 a.m.)	0.4	0.014	2.1	2.0	0.1	0.000	0.011	0.009	0.021	0.000	0.000	0.000	31	20	3	11
	Site # 5A (8:13 a.m. to 9:12 a.m.)	0.3	0.023	2.0	1.9	0.1	0.001	0.002	0.004	0.008	0.000	0.000	0.000	42	25	3	6
	Site # 6A (9:24 a.m. to 10:22 a.m.)	0.2	0.030	2.0	1.9	0.1	0.000	0.002	0.004	0.007	0.001	0.000	0.000	31	18	2	5
	Site # 2A (10:31 a.m. to 11:30 a.m.)	0.3	0.033	2.0	1.9	0.1	0.000	0.005	0.007	0.013	0.000	0.000	0.000	21	12	1	6
	Site # 1 (11:37 a.m. to 12:36 p.m.)	0.3	0.034	1.9	1.8	0.1	0.000	0.008	0.007	0.013	0.001	0.000	0.000	19	12	1	7
	Site # 3A (12:47 p.m. to 1:46 p.m.)	0.3	0.030	2.0	1.9	0.1	0.000	0.012	0.014	0.026	0.001	0.001	0.000	20	13	2	13
	Site # 6A (1:50 p.m. to 2:51 p.m.)	0.4	0.038	2.0	2.0	0.1	0.000	0.002	0.003	0.006	0.000	0.001	0.000	15	9	1	3
	Site # 4A (2:57 p.m. to 3:59 p.m.)	0.4	0.035	2.0	1.9	0.1	0.000	0.004	0.008	0.012	0.000	0.001	0.000	18	10	1	7
	Site # 5A (4:10 p.m. to 5:18 p.m.)	0.5	0.034	1.9	1.9	0.1	0.001	0.006	0.010	0.016	0.000	0.002	0.000	32	18	2	7
	Site # 2 (5:28 p.m. to 6:28 p.m.)	0.5	0.022	2.2	2.1	0.1	0.000	0.009	0.018	0.026	0.000	0.000	0.000	37	24	3	8
	Site # 1B (6:34 p.m. to 7:33 p.m.)	0.6	0.018	2.1	2.0	0.1	0.000	0.022	0.024	0.044	0.001	0.000	0.000	16	10	1	12
14-Jun-01	Site # 4 (5:41 a.m. to 6:40 a.m.)	0.7	0.007	2.2	2.2	0.1	0.000	0.016	0.014	0.029	0.002	0.001	0.001	26	17	3	10
	Site # 3A (6:48 a.m. to 7:53 a.m.)	0.9	0.003	2.3	2.2	0.2	0.000	0.065	0.029	0.093	0.004	0.001	0.001	64	40	5	42
	Site # 6A (7:57 a.m. to 8:56 a.m.)	0.6	0.004	2.2	2.2	0.1	0.001	0.020	0.027	0.046	0.005	0.001	0.001	30	20	3	13
	Site # 1 (9:05 a.m. to 10:04 a.m.)	0.6	0.008	2.1	2.1	0.1	0.000	0.026	0.020	0.046	0.005	0.000	0.001	26	18	3	19
	Site # 5A (10:14 a.m. to 11:15 a.m.)	0.3	0.012	2.0	2.0	0.0	0.000	0.014	0.016	0.029	0.005	0.001	0.000	36	22	3	14
	Site # 2 (11:29 a.m. to 12:29 p.m.)	0.4	0.012	2.1	2.1	0.1	0.000	0.014	0.016	0.030	0.004	0.000	0.001	24	14	2	12
	Site # 4A (12:37 p.m. to 1:37 p.m.)	0.5	0.020	2.1	2.0	0.1	0.001	0.012	0.014	0.027	0.004	0.000	0.000	22	13	2	9
	Site # 6A (1:43 p.m. to 2:43 p.m.)	0.3	0.032	2.0	1.9	0.1	0.001	0.006	0.008	0.014	0.005	0.001	0.000	14	8	1	2
	Site # 3 (2:56 p.m. to 4:09 p.m.)	0.4	0.037	1.9	1.8	0.1	0.001	0.004	0.008	0.012	0.005	0.001	0.000	14	9	1	2
	Site # 1B (4:21 p.m. to 5:28 p.m.)	0.4	0.037	1.9	1.8	0.1	0.000	0.003	0.006	0.009	0.003	0.001	0.000	30	15	2	5
	Site # 5A (5:42 p.m. to 6:42 p.m.)	0.2	0.034	1.9	1.8	0.0	0.000	0.003	0.007	0.011	0.002	0.000	0.000	13	8	1	5
	Site # 2 (6:59 p.m. to 7:59 p.m.)	0.3	0.035	2.0	2.0	0.0	0.000	0.001	0.005	0.007	0.001	0.000	0.000	13	7	1	1
one-hour guideline		**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.172**	**n/a**	**0.212**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

no data - Indicates that the analyzer was not operational for the indicated time period.

Data in *italics* indicates less than 75% data available for the hour.

Data in **bold** indicates the maximum concentration measured during the survey.

n/a No one hour guideline.

ng/m³ - nanograms per cubic metre of air

µg/m³ - micrograms per cubic metre of air

ppm - parts per million

List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_x - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A8: One-hour average air pollutant levels in Whitemud Drive area survey (October and November, 2000).

Date	Monitoring Location and Time (MST)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_X	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
		ppm												$\mu g/m^3$			ng/m^3
26-Oct-00	Site # 2 (5:32 a.m. to 6:32 a.m.)	0.2	0.005	2.0	2.0	0.1	0.001	0.028	0.016	0.044	0.006	0.000	0.000	19	13	3	17
	Site # 1B (6:40 a.m. to 7:44 a.m.)	0.6	0.003	2.0	2.0	0.0	0.003	0.091	0.029	0.116	0.011	0.000	0.000	19	13	3	48
	Site # 4A (7:56 a.m. to 8:54 a.m.)	0.2	0.007	1.9	2.0	0.0	0.001	0.008	0.015	0.022	0.007	0.000	0.000	19	13	3	9
	Site # 6A (9:00 a.m. to 9:59 a.m.)	0.2	0.010	2.0	2.1	0.0	0.001	0.008	0.013	0.019	0.006	0.000	0.000	20	13	3	21
	Site # 3A (10:05 a.m. to 11:03 a.m.)	0.1	0.014	2.0	2.1	0.0	0.002	0.009	0.010	0.018	0.003	0.000	0.000	25	16	3	7
	Site # 5 (11:15 a.m. to 12:13 p.m.)	0.1	0.019	2.0	2.0	0.0	0.003	0.011	0.009	0.018	0.006	0.000	0.000	29	20	3	6
	Site # 2 (12:23 p.m. to 1:24 p.m.)	0.2	0.018	2.0	2.1	0.0	0.003	0.017	0.009	0.025	0.005	0.001	0.000	40	26	4	12
	Site # 1B (1:31 p.m. to 2:30 p.m.)	0.2	0.017	1.9	2.0	0.0	0.004	0.032	0.013	0.042	0.011	0.001	0.000	56	37	5	18
	Site # 4 (2:42 p.m. to 3:55 p.m.)	0.2	0.020	1.8	1.8	0.0	0.003	0.017	0.011	0.027	0.006	0.001	0.000	90	50	6	11
	Site # 5 (4:09 p.m. to 5:11 p.m.)	0.2	0.021	1.7	1.8	0.0	0.002	0.009	0.012	0.020	0.005	0.001	0.000	121	65	6	10
	Site # 3 (5:23 p.m. to 6:22 p.m.)	0.3	0.022	1.7	1.7	0.0	0.001	0.009	0.011	0.018	0.004	0.001	0.000	**459**	**239**	17	6
	Site # 6A (6:28 p.m. to 7:30 p.m.)	0.2	0.027	2.3	2.3	0.1	0.001	0.003	0.006	0.008	0.003	0.001	0.000	123	68	6	2
30-Oct-00	*Site # 1B (6:34 a.m. to 6:56 a.m.)*	*0.8*	*0.000*	*2.3*	*2.3*	*0.0*	*0.003*	*0.149*	*0.018*	*0.163*	*0.008*	*0.001*	*0.002*	*9*	*7*	*2*	*61*
	Site # 1B (7:08 a.m. to 7:45 a.m.)	*1.3*	*0.000*	*2.4*	*2.4*	*0.0*	*0.003*	*0.159*	*0.012*	*0.169*	*0.007*	*0.000*	*0.002*	*11*	*7*	*2*	*70*
	Site # 2 (7:52 a.m. to 8:56 a.m.)	0.6	0.000	2.3	2.4	0.1	0.001	0.063	0.011	0.073	0.002	0.000	0.001	34	20	2	20
	Site # 3 (9:06 a.m. to 10:05 a.m.)	0.6	0.002	2.2	2.3	0.0	0.002	0.051	0.010	0.060	0.004	0.000	0.001	13	8	2	23
	Site # 6B (10:13 a.m. to 11:12 a.m.)	0.2	0.005	2.1	2.2	0.0	0.002	0.032	0.010	0.039	0.003	0.000	0.001	14	8	1	12
	Site # 4 (11:34 a.m. to 12:33 p.m.)	0.2	0.008	2.0	2.2	0.0	0.003	0.025	0.010	0.034	0.002	0.000	0.000	18	10	1	14
	Site # 5 (12:43 p.m. to 1:42 p.m.)	0.1	0.012	2.0	2.1	0.0	0.005	0.013	0.009	0.021	0.002	0.000	0.000	20	12	2	6
	Site # 1B (1:53 p.m. to 2:53 p.m.)	0.1	0.010	2.0	2.2	0.0	0.005	0.025	0.011	0.035	0.004	0.000	0.000	57	36	4	13
	Site # 2 (3:00 p.m. to 4:02 p.m.)	0.2	0.009	2.1	2.2	0.0	0.003	0.023	0.013	0.036	0.005	0.000	0.000	61	39	4	13
	Site # 3 (4:10 p.m. to 5:19 p.m.)	0.7	0.001	2.2	2.3	0.0	0.004	0.075	0.021	0.096	0.004	0.000	0.001	64	43	5	28
	Site # 6A (5:24 p.m. to 5:38 p.m.)	*1.8*	*0.001*	*2.5*	*2.4*	*0.1*	*0.004*	*0.151*	*0.031*	*0.182*	*0.003*	*0.001*	*0.002*	*93*	*56*	*7*	*67*
	Site # 6A (5:51 p.m. to 6:39 p.m.)	1.1	0.001	2.5	2.4	0.1	0.003	0.117	0.020	0.137	0.007	0.000	0.001	91	59	8	76
	Site # 4 (6:48 p.m. to 8:03 p.m.)	0.7	0.000	2.3	2.3	0.1	0.004	0.111	0.021	0.133	0.007	0.000	0.001	129	89	11	47
	Site # 5 (8:14 p.m. to 9:16 p.m.)	0.3	0.000	2.8	2.3	0.6	0.002	0.040	0.023	0.063	0.006	0.000	0.001	160	103	13	29
14-Nov-00	Site # 1 (6:37 a.m. to 7:37 a.m.)	0.6	0.003	2.3	2.3	0.0	0.002	0.042	0.024	0.066	no data			0.000	0.000	4	3	2	13
	Site # 3 (7:50 a.m. to 8:53 a.m.)	1.3	0.000	2.3	2.2	0.1	0.004	0.122	0.032	0.154				0.000	0.000	8	6	2	58
	Site # 6B (9:04 a.m. to 10:03 a.m.)	0.5	0.012	2.1	2.2	0.0	0.003	0.011	0.018	0.029				0.000	0.000	11	7	2	9
	Site # 4 (10:29 a.m. to 11:29 a.m.)	0.3	0.014	2.1	2.1	0.0	0.003	0.023	0.016	0.039				0.000	0.000	34	20	3	15
	Site # 5 (11:40 a.m. to 12:41 p.m.)	0.2	0.024	1.7	1.8	0.0	0.002	0.008	0.009	0.018				0.000	0.000	22	14	3	4
	Site # 2 (12:55 p.m. to 1:53 p.m.)	0.1	0.027	1.7	1.8	0.0	0.002	0.005	0.011	0.016				0.000	0.000	12	8	2	5
	Site # 1 (2:00 p.m. to 3:00 p.m.)	0.2	0.021	1.8	1.8	0.0	0.002	0.017	0.013	0.029				0.000	0.000	23	15	3	11
	Site # 6A (3:12 p.m. to 4:13 p.m.)	0.3	0.013	1.8	1.9	0.0	0.002	0.013	0.023	0.036				0.000	0.000	17	11	2	11
	Site # 3A (4:23 p.m. to 5:29 p.m.)	1.8	0.001	2.1	2.0	0.0	0.006	0.201	**0.041**	0.243				0.001	0.001	83	60	9	**77**
	Site # 4A (5:36 p.m. to 6:37 p.m.)	1.4	0.001	2.1	2.0	0.0	0.005	0.127	0.038	0.164				0.002	0.000	32	24	5	56
	Site # 5A (6:49 p.m. to 7:49 p.m.)	0.7	0.001	2.0	2.0	0.0	0.003	0.106	0.034	0.140				0.000	0.000	17	13	5	46
	Site # 2 (8:02 p.m. to 9:03 p.m.)	1.1	0.000	2.2	2.2	0.1	0.002	0.089	0.032	0.121				0.000	0.000	33	26	5	29
30-Nov-00	Site # 1B (6:34 a.m. to 7:35 a.m.)	0.5	0.006	2.5	2.1	0.3	0.002	0.057	0.020	0.075	0.009	0.001	0.000	13	7	1	35
	Site # 2 (7:49 a.m. to 8:50 a.m.)	0.7	0.003	2.3	2.1	0.1	0.002	0.052	0.023	0.074	0.005	0.001	0.000	15	8	1	25
	Site # 3 (9:01 a.m. to 10:01 a.m.)	0.6	0.004	2.3	2.2	0.1	0.002	0.046	0.021	0.066	0.003	0.001	0.000	12	7	2	28
	Site # 6A (10:07 a.m. to 11:07 a.m.)	0.3	0.013	2.2	2.2	0.0	0.002	0.009	0.014	0.023	0.001	0.000	0.000	17	6	1	6
	Site # 4 (11:16 a.m. to 12:17 p.m.)	0.3	0.012	2.2	2.1	0.0	0.002	0.028	0.014	0.042	0.003	0.000	0.000	17	12	2	12
	Site # 5 (12:28 p.m. to 1:27 p.m.)	0.2	0.017	2.3	2.2	0.0	0.003	0.013	0.008	0.021	0.001	0.000	0.000	13	9	2	6
	Site # 1B (1:40 p.m. to 2:41 p.m.)	0.5	0.012	2.3	2.2	0.0	0.004	0.050	0.014	0.062	0.008	0.001	0.000	7	4	1	17
	Site # 6A (2:52 p.m. to 3:53 p.m.)	0.5	0.011	2.3	2.2	0.0	0.003	0.007	0.014	0.022	0.002	0.000	0.000	9	6	2	7
	Site # 3 (4:01 p.m. to 5:02 p.m.)	0.4	0.007	2.3	2.2	0.0	0.004	0.023	0.019	0.042	0.001	0.000	0.000	6	4	1	12
	Site # 4 (5:14 p.m. to 6:15 p.m.)	0.5	0.006	2.3	2.2	0.0	0.003	0.035	0.018	0.054	0.002	0.000	0.000	7	5	1	13
	Site # 5 (6:37 p.m. to 7:38 p.m.)	0.3	0.013	2.3	2.2	0.0	0.003	0.009	0.012	0.021	0.001	0.000	0.000	4	3	1	5
	Site # 2 (7:48 p.m. to 8:49 p.m.)	0.5	0.011	2.5	2.2	0.2	0.004	0.016	0.015	0.031	0.001	0.000	0.000	5	4	1	5
	one-hour guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.172**	**n/a**	**0.212**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

no data - Indicates that the analyzer was not operational for the indicated time period.
Data in *italics* indicates less than 75% data available for the hour.
Data in **bold** indicates the maximum concentration measured during the survey.
n/a No one hour guideline
ng/m^3 - nanograms per cubic metre of air
$\mu g/m^3$ - micrograms per cubic metre of air
ppm - parts per million

List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_X - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A9: One-hour average air pollutant levels in Whitemud Drive area survey (January and February, 2001).

Date	Monitoring Location and Time (MST)	CO	O_3	THC	CH_4	RHC	SO_2	NO	NO_2	NO_x	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
		ppm												$\mu g/m^3$			ng/m^3
10-Jan-01	Site # 1B (6:40 a.m. to 7:41 a.m.)	0.6	0.007	3.0	2.2	0.7	0.001	0.042	0.021	0.064	0.010	0.000	0.001	8	5	1	20
	Site # 2A (7:58 a.m. to 9:09 a.m.)	0.6	0.005	3.1	2.3	0.7	0.001	0.037	0.023	0.060	0.012	0.000	0.001	11	8	2	20
	Site # 3 (9:16 a.m. to 10:18 a.m.)	0.5	0.005	3.1	2.3	0.8	0.001	0.052	0.024	0.076	0.010	0.000	0.001	19	14	3	23
	Site # 6A (10:24 a.m. to 11:23 a.m.)	0.3	0.008	3.1	2.3	0.7	0.001	0.017	0.017	0.034	0.010	0.000	0.000	19	14	2	8
	Site # 4 (11:32 a.m. to 12:32 p.m.)	0.5	0.009	3.1	2.3	0.8	0.004	0.048	0.018	0.067	0.012	0.000	0.001	81	51	7	25
	Site # 5 (12:43 p.m. to 1:42 p.m.)	0.4	0.016	3.1	2.3	0.8	0.002	0.016	0.017	0.033	0.011	0.000	0.001	51	31	4	13
	Site # 1 (1:59 p.m. to 3:00 p.m.)	0.4	0.013	3.1	2.2	0.8	0.003	0.017	0.021	0.038	0.008	0.000	0.001	79	45	6	12
	Site # 2A (3:08 p.m. to 4:06 p.m.)	1.1	0.002	3.4	2.3	1.0	0.003	0.089	0.030	0.120	0.012	0.000	0.001	241	135	16	32
	Site # 3 (4:17 p.m. to 5:26 p.m.)	1.5	0.001	3.4	2.3	1.0	0.004	0.154	0.033	0.187	0.020	0.001	0.002	132	90	14	64
	Site # 6 (5:41 p.m. to 6:40 p.m.)	2.2	0.001	3.9	2.5	1.3	0.004	**0.230**	0.033	**0.262**	0.018	0.001	0.002	66	49	11	49
	Site # 4 (6:54 p.m. to 7:57 p.m.)	**2.7**	0.001	**4.4**	**2.7**	**1.6**	0.003	0.212	0.034	0.246	0.022	0.001	0.002	114	80	14	58
	Site # 5 (8:07 p.m. to 9:06 p.m.)	1.9	0.001	3.8	2.4	1.3	0.003	0.188	0.031	0.220	0.016	0.002	**0.003**	85	66	13	55
13-Feb-01	Site # 1B (6:29 a.m. to 7:31 a.m.)	0.7	0.001	2.3	2.3	0.1	0.001	0.079	0.024	0.104	0.004	0.000	0.001	41	32	6	23
	Site # 2 (7:40 a.m. to 8:44 a.m.)	0.6	0.002	2.7	2.4	0.2	0.000	0.013	0.014	0.028	0.001	0.000	0.000	34	24	5	5
	Site # 6B (8:50 a.m. to 9:49 a.m.)	0.5	0.004	2.4	2.2	0.2	0.001	0.039	0.023	0.062	0.005	0.000	0.000	170	102	11	19
	Site # 3 (9:58 a.m. to 10:59 a.m.)	0.4	0.009	2.4	2.2	0.1	0.003	0.036	0.020	0.056	0.003	0.000	0.000	43	30	5	9
	Site # 4 (11:16 a.m. to 12:16 p.m.)	0.4	0.013	2.2	2.2	0.0	0.004	0.032	0.018	0.050	0.005	0.000	0.000	100	63	9	14
	Site # 5 (12:25 p.m. to 1:28 p.m.)	0.3	0.020	2.1	2.1	0.0	0.006	0.011	0.013	0.024	0.003	0.000	0.000	79	45	6	4
	Site # 1B (1:39 p.m. to 2:40 p.m.)	0.5	0.015	2.1	2.1	0.0	0.006	0.040	0.017	0.057	0.004	0.000	0.000	90	59	9	17
	Site # 2 (2:47 p.m. to 3:49 p.m.)	0.4	0.018	2.0	2.1	0.0	0.002	0.015	0.016	0.031	0.004	0.000	0.000	80	47	6	8
	Site # 6B (3:54 p.m. to 4:59 p.m.)	0.3	0.020	2.0	2.1	0.0	0.002	0.003	0.014	0.018	0.003	0.000	0.000	263	153	15	4
	Site # 3 (5:08 p.m. to 6:13 p.m.)	0.4	0.013	2.0	2.0	0.0	0.002	0.013	0.022	0.035	0.002	0.000	0.000	63	42	6	7
	Site # 4 (6:22 p.m. to 7:22 p.m.)	0.4	0.017	2.0	2.1	0.0	0.002	0.012	0.018	0.031	0.002	0.000	0.000	85	55	7	10
	Site # 6 (7:34 p.m. to 8:35 p.m.)	0.4	0.018	2.1	2.1	0.0	0.001	0.007	0.014	0.021	0.005	0.000	0.000	47	31	5	5
16-Feb-01	Site # 6A (6:34 a.m. to 7:34 a.m.)	0.8	0.001	2.0	2.0	0.0	0.000	0.023	0.027	0.049	0.003	0.000	0.000	10	7	1	8
	Site # 2 (7:45 a.m. to 8:54 a.m.)	0.6	0.011	2.1	2.1	0.1	0.000	0.004	0.010	0.015	0.001	0.000	0.000	7	5	2	3
	Site # 6B (9:16 a.m. to 10:20 a.m.)	0.4	0.014	2.1	2.0	0.0	0.002	0.015	0.016	0.030	0.006	0.001	0.000	11	8	2	5
	Site # 3 (10:27 a.m. to 11:27 a.m.)	0.5	0.018	2.0	2.0	0.0	0.002	0.017	0.013	0.031	0.004	0.000	0.000	45	32	6	6
	Site # 4 (11:33 a.m. to 12:33 p.m.)	0.3	0.019	1.9	1.9	0.0	0.005	0.025	0.014	0.039	0.002	0.000	0.000	238	164	24	11
	Site # 5 (12:43 p.m. to 1:43 p.m.)	0.4	0.026	1.9	1.9	0.0	0.004	0.008	0.008	0.016	0.001	0.000	0.000	68	46	7	4
	Site # 1B (1:53 p.m. to 3:18 p.m.)	0.2	0.030	1.8	1.9	0.0	0.001	0.002	0.005	0.008	0.000	0.000	0.000	33	21	4	2
	Site # 2A (3:24 p.m. to 4:21 p.m.)	0.2	0.028	1.8	1.9	0.0	0.001	0.013	0.011	0.023	0.004	0.000	0.000	187	114	14	6
	Site # 3 (4:29 p.m. to 5:31 p.m.)	0.3	0.017	1.9	1.9	0.0	0.002	0.022	0.017	0.039	0.002	0.000	0.000	85	52	8	8
	Site # 4 (5:52 p.m. to 6:56 p.m.)	0.7	0.003	1.9	1.9	0.0	0.002	0.068	0.033	0.101	0.004	0.000	0.000	187	120	16	23
	Site # 5 (7:05 p.m. to 8:04 p.m.)	0.5	0.007	1.9	1.9	0.0	0.001	0.013	0.029	0.042	0.001	0.000	0.000	76	49	6	26
	Site # 6B (8:23 p.m. to 9:22 p.m.)	0.7	0.001	2.1	2.0	0.0	0.001	0.044	0.035	0.080	0.001	0.000	0.000	74	50	8	28
27-Feb-01	Site # 1 (6:41 a.m. to 7:40 a.m.)	0.6	0.009	2.7	2.0	0.7	0.006	0.015	0.026	0.040	0.005	0.001	0.000	6	3	1	12
	Site # 2 (7:47 a.m. to 8:49 a.m.)	0.6	0.007	3.3	2.4	0.9	0.003	0.022	0.016	0.038	0.007	0.001	0.000	18	14	3	4
	Site # 5 (9:01 a.m. to 10:00 a.m.)	0.4	0.025	2.5	1.9	0.7	0.005	0.010	0.013	0.022	0.008	0.001	0.000	12	7	1	7
	Site # 4 (10:12 a.m. to 11:11 a.m.)	0.4	0.021	2.5	1.8	0.7	0.006	0.027	0.018	0.045	0.007	0.001	0.000	133	75	10	21
	Site # 3 (11:19 a.m. to 12:18 p.m.)	0.3	0.028	2.5	1.8	0.7	0.009	0.014	0.013	0.026	0.008	0.001	0.000	94	56	8	5
	Site # 6B (12:25 p.m. to 1:25 p.m.)	0.4	0.029	2.5	1.8	0.6	**0.015**	0.012	0.013	0.024	0.008	0.001	0.000	36	21	4	2
	Site # 1 (1:36 p.m. to 2:35 p.m.)	0.2	0.029	2.5	1.9	0.6	0.012	0.010	0.013	0.022	0.006	0.002	0.001	43	28	5	5
	Site # 2A (2:42 p.m. to 3:41 p.m.)	0.3	0.028	2.5	1.8	0.7	0.010	0.019	0.017	0.035	0.008	0.001	0.001	138	91	12	9
	Site # 5 (3:50 p.m. to 4:50 p.m.)	0.3	0.025	2.5	1.8	0.6	0.011	0.010	0.019	0.028	0.008	0.001	0.001	58	35	6	6
	Site # 4 (4:59 p.m. to 6:06 p.m.)	0.9	0.008	2.5	1.8	0.7	0.007	0.043	0.036	0.078	0.009	0.001	0.001	145	96	14	26
	Site # 3 (6:15 p.m. to 7:16 p.m.)	1.5	0.001	2.6	1.9	0.7	0.009	0.109	**0.041**	0.149	0.010	0.002	0.002	124	93	17	28
	Site # 6B (7:22 p.m. to 8:22 p.m.)	1.7	0.004	3.1	2.1	0.9	0.008	0.132	0.036	0.169	0.008	0.002	0.002	99	79	16	30
one-hour guideline		**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.172**	**n/a**	**0.212**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

no data - Indicates that the analyzer was not operational for the indicated time period.
Data in *italics* indicates less than 75% data available for the hour.
Data in **bold** indicates the maximum concentration measured during the survey.
n/a No one hour guideline.
ng/m^3 - nanograms per cubic metre of air
$\mu g/m^3$ - micrograms per cubic metre of air
ppm - parts per million

List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_x - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A10: One-hour average air pollutant levels in Whitemud Drive area survey (April and May, 2001).

Date	Monitoring Location and Time (MST)	CO	O_3	THC	CH_4	RHC*	SO_2	NO	NO_2	NO_x	NH_3	TRS	H_2S	TSP	PM_{10}	$PM_{2.5}$	PAH
		ppm												$\mu g/m^3$			ng/m^3
18-Apr-01	Site # 1 (5:34 a.m. to 6:34 a.m.)	0.4	0.009	2.6	2.0	0.5	0.005	0.019	0.031	0.047	0.000	0.003	0.000	45	31	5	10
	Site # 2 (6:39 a.m. to 7:49 a.m.)	0.2	0.024	2.6	2.1	0.5	0.004	0.005	0.010	0.012	0.000	0.002	0.000	65	44	6	1
	Site # 3 (8:03 a.m. to 9:04 a.m.)	1.6	0.027	2.5	1.9	0.5	0.011	0.017	0.023	0.037	0.001	0.002	0.000	70	44	6	8
	Site # 6B (9:14 a.m. to 10:14 a.m.)	0.6	0.045	2.4	1.9	0.4	0.008	0.006	0.010	0.012	0.000	0.002	0.000	52	30	5	1
	Site # 4 (10:25 a.m. to 11:25 a.m.)	0.6	0.041	2.4	1.9	0.4	0.005	0.011	0.014	0.021	0.000	0.003	0.000	64	39	6	10
	Site # 5 (11:34 a.m. to 12:33 p.m.)	1.0	0.049	2.4	1.9	0.4	0.006	0.002	0.004	0.006	0.000	**0.005**	0.000	41	24	5	2
	Site # 1 (12:45 p.m. to 1:45 p.m.)	0.5	0.049	2.3	1.9	0.4	0.005	0.001	0.004	0.005	0.000	0.004	0.001	49	29	5	2
	Site # 2 (1:50 p.m. to 2:52 p.m.)	0.3	0.051	2.3	1.9	0.4	0.004	0.001	0.003	0.004	0.000	0.004	0.000	71	42	7	1
	Site # 3 (3:04 p.m. to 4:12 p.m.)	0.3	0.045	2.3	1.8	0.4	0.004	0.005	0.009	0.014	0.000	0.002	0.000	176	108	14	5
	Site # 6B (4:19 p.m. to 5:20 p.m.)	0.4	0.050	2.3	1.9	0.4	0.004	0.004	0.005	0.008	0.000	0.003	0.000	428	**239**	28	2
	Site # 4 (5:29 p.m. to 6:31 p.m.)	0.8	0.035	2.4	1.9	0.4	0.005	0.007	0.018	0.025	0.000	0.004	0.000	77	46	7	8
	Site # 5 (6:38 p.m. to 7:40 p.m.)	0.1	0.043	2.3	1.8	0.4	0.004	0.001	0.007	0.008	0.000	0.003	0.000	78	47	8	3
19-Apr-01	Site # 1 (5:51 a.m. to 6:54 a.m.)	0.7	0.023	2.4	1.9	0.4	0.005	0.015	0.018	0.032	0.000	0.002	0.001	75	47	8	14
	Site # 2A (7:07 a.m. to 8:08 a.m.)	0.5	0.024	2.4	1.9	0.4	0.004	0.008	0.020	0.027	0.000	0.002	0.001	186	114	16	9
	Site # 3A (8:19 a.m. to 9:18 a.m.)	0.3	0.030	2.3	1.9	0.4	0.004	0.017	0.015	0.032	0.008	0.002	0.001	71	48	9	14
	Site # 6A (9:22 a.m. to 10:24 a.m.)	0.5	0.040	2.4	1.9	0.4	0.004	0.004	0.006	0.010	0.000	0.002	0.001	71	45	8	3
	Site # 4A (10:29 a.m. to 11:29 a.m.	0.6	0.039	2.3	1.9	0.4	0.004	0.006	0.008	0.015	0.000	0.002	0.000	46	32	7	5
	Site # 5A (11:40 a.m. to 12:41 p.m.	0.4	0.044	2.3	1.8	0.4	0.004	0.002	0.004	0.008	0.000	0.002	0.000	54	35	8	3
	Site # 1 (12:54 p.m. to 1:53 p.m.)	0.8	0.038	2.4	1.8	0.4	0.005	0.011	0.009	0.020	0.002	0.003	0.000	55	36	7	8
	Site # 2A (2:10 p.m. to 3:11 p.m.)	0.9	0.037	2.2	1.8	0.3	0.001	0.006	0.008	0.013	0.001	0.000	0.000	68	37	5	6
	Site # 3A (3:18 p.m. to 4:30 p.m.)	0.6	0.025	2.2	1.9	0.3	0.002	0.029	0.016	0.046	0.004	0.000	0.001	61	31	4	14
	Site # 6A (4:33 p.m. to 5:33 p.m.)	0.4	0.036	2.2	1.8	0.3	0.000	0.003	0.005	0.008	0.002	0.000	0.000	65	37	5	2
	Site # 4A (5:38 p.m. to 6:38 p.m.)	0.5	0.033	2.2	1.8	0.3	0.000	0.004	0.007	0.011	0.001	0.000	0.000	204	100	9	10
	Site # 5A (6:48 p.m. to 7:48 p.m.)	0.3	0.034	2.2	1.8	0.3	0.000	0.002	0.004	0.006	0.000	0.000	0.000	43	23	2	1
3-May-01	Site # 5 (5:51 a.m. to 6:51 a.m.)	0.5	0.014	2.5	2.4	0.1	0.001	0.018	0.020	0.036	0.004	0.000	0.000	85	43	4	14
	Site # 4 (7:10 a.m. to 8:14 a.m.)	0.3	0.014	2.5	2.4	0.1	0.002	0.030	0.020	0.050	0.007	0.001	0.000	64	40	5	21
	Site # 3 (8:22 a.m. to 9:20 a.m.)	0.1	0.034	2.4	2.3	0.1	0.001	0.005	0.010	0.015	0.001	0.001	0.000	72	42	5	5
	Site # 6B (9:29 a.m. to 10:28 a.m.)	0.4	0.041	2.3	2.2	0.1	0.000	0.003	0.004	0.007	0.001	0.001	0.000	43	24	3	2
	Site # 2A (10:41 a.m. to 11:40 a.m.)	0.0	0.042	2.3	2.3	0.1	0.000	0.001	0.002	0.003	0.000	0.000	0.000	41	21	2	1
	Site # 1A (12:02 p.m. to 12:59 p.m.)	0.1	0.044	2.2	2.1	0.1	0.000	0.001	0.002	0.002	0.000	0.000	0.000	33	19	2	1
	Site # 5 (1:12 p.m. to 2:12 p.m.)	0.5	0.041	2.1	2.0	0.1	0.000	0.001	0.002	0.004	0.000	0.000	0.000	43	24	2	3
	Site # 4 (2:22 p.m. to 3:21 p.m.)	0.5	0.032	2.2	2.0	0.2	0.000	0.010	0.010	0.021	0.002	0.000	0.000	47	27	3	11
	Site # 3 (3:29 p.m. to 4:36 p.m.)	0.2	0.033	2.1	2.0	0.1	0.000	0.005	0.009	0.015	0.001	0.000	0.000	55	29	3	6
	Site # 6 (4:45 p.m. to 5:44 p.m.)	0.2	0.040	2.1	1.9	0.1	0.000	0.001	0.002	0.003	0.001	0.000	0.000	59	34	3	2
	Site # 2 (5:53 p.m. to 6:54 p.m.)	0.3	0.027	2.2	2.0	0.1	0.000	0.005	0.012	0.017	0.002	0.000	0.000	70	40	4	6
	Site # 1 (7:01 p.m. to 7:59 p.m.)	0.3	0.029	2.1	1.9	0.2	0.000	0.001	0.011	0.011	0.001	0.000	0.000	172	95	8	2
24-May-01	Site # 1B (5:49 a.m. to 6:49 a.m.)	0.9	0.002	2.5	2.3	0.2	0.001	0.076	0.028	0.102	0.001	0.001	0.001	140	92	12	39
	Site # 2 (7:01 a.m. to 8:01 a.m.)	0.9	0.002	2.7	2.5	0.2	0.000	0.062	0.023	0.085	0.000	0.001	0.000	200	128	15	43
	Site # 6B (8:05 a.m. to 9:05 a.m.)	0.8	0.010	2.5	2.3	0.2	0.000	0.024	0.019	0.043	0.000	0.000	0.000	230	141	16	21
	Site # 3A (9:24 a.m. to 10:24 a.m.)	0.6	0.016	2.3	2.2	0.1	0.001	0.041	0.020	0.060	**0.039**	0.000	0.000	103	59	8	30
	Site # 4A (10:31 a.m. to 11:31 a.m.)	0.4	0.037	2.2	2.0	0.1	0.000	0.009	0.007	0.015	0.008	0.000	0.000	117	62	8	8
	Site # 5A (11:42 a.m. to 12:42 p.m.)	1.1	**0.059**	2.3	1.9	0.4	0.000	0.006	0.010	0.016	0.024	0.000	0.000	185	102	**37**	8
	Site # 1B (12:57 p.m. to 1:57 p.m.)	0.6	0.052	2.3	1.9	0.4	0.000	0.007	0.010	0.015	0.015	0.000	0.000	282	230	19	6
	Site # 2A (2:11 p.m. to 3:11 p.m.)	0.5	0.053	2.2	2.0	0.2	0.000	0.005	0.006	0.009	0.008	0.000	0.000	89	51	10	2
	Site # 3A (3:20 p.m. to 4:20 p.m.)	0.9	0.036	2.1	1.8	0.3	0.001	0.022	0.023	0.044	0.010	0.000	0.000	100	60	15	18
	Site # 6A (4:29 p.m. to 5:29 p.m.)	0.7	0.044	2.1	1.9	0.2	0.000	0.004	0.013	0.017	0.010	0.000	0.000	88	52	13	5
	Site # 4A (5:34 p.m. to 6:34 p.m.)	0.7	0.033	2.1	1.9	0.2	0.000	0.007	0.018	0.024	0.006	0.000	0.000	63	39	9	8
	Site # 5A (6:44 p.m. to 7:44 p.m.)	0.6	0.027	2.1	1.9	0.2	0.000	0.008	0.018	0.025	0.009	0.000	0.000	69	44	11	7
	one-hour guideline	**13.0**	**0.082**	**n/a**	**n/a**	**n/a**	**0.172**	**n/a**	**0.212**	**n/a**	**2.0**	**n/a**	**0.010**	**n/a**	**n/a**	**n/a**	**n/a**

no data - Indicates that the analyzer was not operational for the indicated time period.
Data in *italics* indicates less than 75% data available for the hour.
Data in **bold** indicates the maximum concentration measured during the survey.
n/a No one hour guideline.
ng/m^3 - nanograms per cubic metre of air
$\mu g/m^3$ - micrograms per cubic metre of air
ppm - parts per million

List of Air Quality Parameters

CO - carbon monoxide
O_3 - ozone
THC - total hydrocarbons
CH_4 - methane
RHC - reactive hydrocarbons
SO_2 - sulphur dioxide
NO - nitric oxide
NO_2 - nitrogen dioxide
NO_x - total oxides of nitrogen
NH_3 - ammonia
TRS - total reduced sulphur
H_2S - hydrogen sulphide
TSP - total suspended particulates
PM_{10} - inhalable particulates
$PM_{2.5}$ - respirable particulates
PAH - polycyclic aromatic hydrocarbons

Table A11 Weather conditions and operator's observations in Whitemud Drive area survey (June 2000 and June 2001).

Date	Monitoring Location and Time (MST)	MAML Operator's Comments and Observations	Temp. °C	RH %	WSP km/h	Cloud	WDR
21-Jun-00	Site # 1 (5:27 a.m. to 6:26 a.m.)	Brookside.	14	68	7	100%	SW
	Site # 3 (6:37 a.m. to 7:36 a.m.)	Spitting rain.	15	67	8	100%	W
	Site # 6B (7:50 a.m. to 8:49 a.m.)	Quesnell Heights.	16	64	6	80%	SW
	Site # 4A (8:55 a.m. to 9:54 a.m.)	Patricia Heights.	18	51	8	10%	W
	Site # 5 (10:22 a.m. to 11:22 a.m.)	Aldergrove.	21	36	13	10%	W
	Site # 2 (11:40 a.m. to 12:40 p.m.)	Fort Edmonton.	21	33	8	20%	SW
	Site # 1 (12:49 p.m. to 2:04 p.m.)	Brookside.	21	30	14	60%	NW
	Site # 3A (2:13 p.m. to 3:14 p.m.)	Rio Terrace. All exhaust readings from this hr are from the fwy.	24	26	5	60%	S
	Site # 6B (3:20 p.m. to 4:21 p.m.)	Quesnell Heights.	22	28	7	50%	V
	Site # 4A (4:26 p.m. to 5:28 p.m.)	Patricia Heights.	23	26	6	40%	V
	Site # 5A (5:38 p.m. to 6:39 p.m.)	Lymburn 5:40PM-No readings from lawn mower operating 20m in front of MAML 5:42PM-Mowing stopped.	21	27	8	70%	W
	Site # 2 (6:49 p.m. to 7:49 p.m.)	Fort Edmonton.	20	26	4	70%	NW
22-Jun-00	Site # 4A (5:59 a.m. to 6:57 a.m.)	Patricia Heights.	14	54	9	0%	W
	Site # 3A (7:06 a.m. to 8:05 a.m.)	Rio Terrace.	17	40	6	0%	V
	Site # 6B (8:09 a.m. to 9:08 a.m.)	QuesnellHeights.	17	38	8	0%	W
	Site # 5A (9:21 a.m. to 10:20 a.m.)	Lymburn.	19	33	11	0%	W
	Site # 2 (10:30 a.m. to 11:30 a.m.)	Stop at site #2.	19	33	8	60%	SW
	Site # 1 (11:35 a.m. to 12:36 p.m.)	Brookside.	19	32	11	80%	W
	Site # 4A (12:43 p.m. to 1:43 p.m.)	Patricia Heights. 1:39 PM- Exhaust from cement truck nearby.	21	27	9	60%	SW
	Site # 3A (1:49 p.m. to 2:50 p.m.)	Rio Terrace. All exhaust readings from this hour are from the fwy.	21	28	4	50%	S
	Site # 6B (3:20 p.m. to 4:21 p.m.)	QuesnellHeights.	21	28	8	50%	SW
	Site # 5A (4:07 p.m. to 5:09 p.m.)	Lymburn.	17	40	13	80%	SW
	Site # 2 (5:24 p.m. to 6:24 p.m.)	Fort Edmonton.	17	47	8	80%	SW
	Site # 1 (6:29 p.m. to 7:31 p.m.)	Brookside.	18	45	8	20%	SW
13-Jun-01	Site # 3 (5:39 a.m. to 6:39 a.m.)	Some rain showers.	11	90	4	80%	W
	Site # 4 (6:49 a.m. to 7:56 a.m.)	Set out carbotrap #30 and blank #31.	14	75	6	60%	V
	Site # 5A (8:13 a.m. to 9:12 a.m.)	Stop at Site #5A.	15	67	5	40%	W
	Site # 6B (9:24 a.m. to 10:22 a.m.)	9:39AM-Lawn mowing going on around the MAML. 9:43AM-Lawn mowers gone.	18	52	5	40%	SW
	Site # 2A (10:31 a.m. to 11:30 a.m.)	Stop at Site #2A.	19	44	9	20%	W
	Site # 1 (11:37 a.m. to 12:36 p.m.)	Stop at Site #1.	20	38	9	40%	W
	Site # 3A (12:47 p.m. to 1:46 p.m.)	Stop at Site #3A.	21	35	6	20%	SW
	Site # 6B (1:50 p.m. to 2:51 p.m.)	Stop at Site #6B.	22	30	6	30%	SW
	Site # 4A (2:57 p.m. to 3:59 p.m.)	Stop at Site #4A.	23	27	7	20%	SW
	Site # 5A (4:10 p.m. to 5:18 p.m.)	Setout carbotrap # 32. Light rain.	21	31	7	30%	SW
	Site # 2 (5:28 p.m. to 6:28 p.m.)	5:42PM-stopped raining.	17	58	4	100%	E
	Site # 1B (6:34 p.m. to 7:33 p.m.)	Stop at Site #1B.	19	39	4		NE
14-Jun-01	Site # 4 (5:41 a.m. to 6:40 a.m.)	Wind shifted to a more northerly component. Swirling lt wind giving readings from fwy.	12	78	5	80%	W
	Site # 3A (6:48 a.m. to 7:53 a.m.)	Start carbotrap #33.	14	70	3		SW
	Site # 6B (7:57 a.m. to 8:56 a.m.)	Stop at Site #6B.	14	74	3	ovcst	SW
	Site # 1 (9:05 a.m. to 10:04 a.m.)	Overcast sky, light rain.	13	83	5	ovcst	NW
	Site # 5A (10:14 a.m. to 11:15 a.m.)	Some rain.	13	80	7	ovcst	V
	Site # 2 (11:29 a.m. to 12:29 p.m.)	Parking lot is filling up.	14	78	4	ovcst	SE
	Site # 4A (12:37 p.m. to 1:37 p.m.)	Stop at Site #4A.	15	64	7	ovcst	NE
	Site # 6B (1:43 p.m. to 2:43 p.m.)	Stop at Site #6B.	19	45	5	70%	SE
	Site # 3 (2:56 p.m. to 4:09 p.m.)	Set out carbotrap # 34.	20	38	4	80%	SE
	Site # 1B (4:21 p.m. to 5:28 p.m.)	Normal traffic.	18	46	5	70%	W
	Site # 5A (5:42 p.m. to 6:42 p.m.)	Stop at Site #5A.	17	55	9	ovcst	NW
	Site # 2 (6:59 p.m. to 7:59 p.m.)	Stop at site #2.	16	57	7	n/a	NW

List of Weather Parameters

Temp. - ambient temperature in degrees Celcius
RH - relative humidity in percent
WSP - wind speed in kilometers per hour
WDR - wind direction
Cloud - percent cloud cover
V - Variable winds

Table A12 Weather conditions and operator's observations in Whitemud Drive area survey (October and November 2000).

Date	Monitoring Location and Time (MST)	MAML Operator's Comments and Observations	Temp. °C	RH %	WSP km/h	Cloud	WDR
26-Oct-00	Site # 2 (5:32 a.m. to 6:32 a.m.)	Site #2.	6	84	9	dark	E
	Site # 1B (6:40 a.m. to 7:44 a.m.)	Brander Gardens. 6:42AM-set out carbotraps.	5	87	9	dark	E
	Site # 4A (7:56 a.m. to 8:54 a.m.)	Patricia Heights.	5	85	9	overcast	E
	Site # 6B (9:00 a.m. to 9:59 a.m.)	Quesnell Heights.	5	84	11	overcast	E
	Site # 3A (10:05 a.m. to 11:03 a.m.)	Rio Terrace.	8	72	9	80%	SE
	Site # 5 (11:15 a.m. to 12:13 p.m.)	Aldergrove.	10	65	14	60%	SE
	Site # 2 (12:23 p.m. to 1:24 p.m.)	Site #2.	12	59	14	20%	SE
	Site # 1B (1:31 p.m. to 2:30 p.m.)	Brander Gardens. 6:42 AM-set out carbotrap tubes.	13	55	18	10%	SE
	Site # 4 (2:42 p.m. to 3:55 p.m.)	2:44 PM-Elmwood. Set out carbotrap #03.	15	48	10	10%	SE
	Site # 5 (4:09 p.m. to 5:11 p.m.)	Aldergrove.	13	55	13	10%	SE
	Site # 3 (5:23 p.m. to 6:22 p.m.)	Lynnwood. 5:25PM-Note: high particulates.	12	53	7	30%	SE
	Site # 6B (6:28 p.m. to 7:30 p.m.)	Quesnell Heights. 6:30PM-Elevated THC & particulates due to local traffic on Quesnell Cr.	11	55	8	dark	SE
30-Oct-00	*Site # 1B (6:34 a.m. to 6:56 a.m.)*	*Riverbend.*	*1*	*92*	*3*	*dark*	*SE*
	Site # 1B (7:08 a.m. to 7:45 a.m.)	*Riverbend.*	*0*	*95*	*2*	*dark*	*V*
	Site # 2 (7:52 a.m. to 8:56 a.m.)	Fort Edmonton.	0	96	3	80%	SW
	Site # 3 (9:06 a.m. to 10:05 a.m.)	Lynnwood. Light snow.	3	80	3	60%	S
	Site # 6C (10:13 a.m. to 11:12 a.m.)	Laurier Heights.	8	57	4	10%	S
	Site # 4 (11:34 a.m. to 12:33 p.m.)	Elmwood.	8	60	4	10%	S
	Site # 5 (12:43 p.m. to 1:42 p.m.)	Aldergrove.	8	60	7	0%	S
	Site # 1B (1:53 p.m. to 2:53 p.m.)	Riverbend.	11	53	7	0%	S
	Site # 2 (3:00 p.m. to 4:02 p.m.)	Fort Edmonton.	11	52	7	0%	SW
	Site # 3 (4:10 p.m. to 5:19 p.m.)	Lynnwood. 4:11PM-set out carbo trap #5. Atmosphere looks hazy. 5:01PM-elevated exh. drifting in from fwy.	9	60	1	hazy	S
	Site # 6B (5:24 p.m. to 5:38 p.m.)	*Quesnell Heights. Still elevated exhaust even while traveling to this site. Elevated PAH's would indicate Whitemud diesel exhaust.*	*6*	*75*	*2*	*0%*	*N*
	Site # 6B (5:51 p.m. to 6:39 p.m.)	Still elevated PAH's. Some influence from local traffic.	4	85	1	hazy	V
	Site # 4 (6:48 p.m. to 8:03 p.m.)	Set out carbo tube #6.	4	81	3	dark	S
	Site # 5 (8:14 p.m. to 9:16 p.m.)	Aldergrove.	3	82	2	dark	SE
14-Nov-00	Site # 1 (6:37 a.m. to 7:37 a.m.)	Start hour average.	-5.0	89	6.1	0%	SW
	Site # 3 (7:50 a.m. to 8:53 a.m.)	Lynnwood.	-4.2	86	5.4	0%	W
	Site # 6C (9:04 a.m. to 10:03 a.m.)	Laurier Heights.	-2.4	79	3.5	0%	W
	Site # 4 (10:29 a.m. to 11:29 a.m.)	Elmwood.	0.7	66	7.5	0%	W
	Site # 5 (11:40 a.m. to 12:41 p.m.)	Aldergrove.	3.2	61	8.5	0%	W
	Site # 2 (12:55 p.m. to 1:53 p.m.)	Fort Edmonton.	3.5	60	10.7	0%	N
	Site # 1 (2:00 p.m. to 3:00 p.m.)	Brookside.	2	65	12	0%	N
	Site # 6B (3:12 p.m. to 4:13 p.m.)	QuesnellHeights.	2	68	6	10%	W
	Site # 3A (4:23 p.m. to 5:29 p.m.)	Rio Terrace. 4:25PM-set out carbo trap.	0	77	3	0%	NW
	Site # 4A (5:36 p.m. to 6:37 p.m.)	Patricia Heights.	-1	81	2	dark	W
	Site # 5A (6:49 p.m. to 7:49 p.m.)	Lymburn.	-3	88	3	dark	WNW
	Site # 2 (8:02 p.m. to 9:03 p.m.)	Fort Edmonton.	-5	95	2	dark	WSW
30-Nov-00	Site # 1B (6:34 a.m. to 7:35 a.m.)	Riverbend Rd. - light snow. 7:17AM-Westbound traffic backed up on Quesnell bridge.	-5	93	7	100%	E
	Site # 2 (7:49 a.m. to 8:50 a.m.)	Set out carbotrap #9 (traffic still very slow).	-5	93	8	100%	E
	Site # 3 (9:01 a.m. to 10:01 a.m.)	Lynwood.	-5	93	6	100%	E
	Site # 6B (10:07 a.m. to 11:07 a.m.)	Quesnell Heights. Light snow.	-4	87	5	100%	E
	Site # 4 (11:16 a.m. to 12:17 p.m.)	Elmwood. Light snow.	-3	85	6	100%	SE
	Site # 5 (12:28 p.m. to 1:27 p.m.)	Primrose. Light snow.	-3	81	8	90%	SE
	Site # 1B (1:40 p.m. to 2:41 p.m.)	Riverbend. Light snow. Previous hr is result of traffic exhaust	-4	84	12	100%	SE
	Site # 6B (2:52 p.m. to 3:53 p.m.)	Quesnell Heights. Light snow. Previous hr is traffic exhaust	-4	87	5	100%	E
	Site # 3 (4:01 p.m. to 5:02 p.m.)	Lynnwood. Light snow.	-4	89	7	100%	SE
	Site # 4 (5:14 p.m. to 6:15 p.m.)	Elmwood. Lt snow. Set out carbotrap # 10.	-4	89	4	100%	W
	Site # 5 (6:37 p.m. to 7:38 p.m.)	Primrose. Dark and no snow.	-5	91	7	dark	SE
	Site # 2 (7:48 p.m. to 8:49 p.m.)	John Janzen Centre. Dark and no snow.	-4	89	5	dark	SE

List of Weather Parameters

Temp. - ambient temperature in degrees Celcius
RH - relative humidity in percent
WSP - wind speed in kilometers per hour
WDR - wind direction
Cloud - percent cloud cover
V - Variable winds

Table A13 Weather conditions and operator's observations in Whitemud Drive area survey (January and February 2001).

Date	Monitoring Location and Time (MST)	MAML Operator's Comments and Observations	Temp. °C	RH %	WSP km/h	Cloud	WDR
10-Jan-01	Site # 1B (6:40 a.m. to 7:41 a.m.)	Light to normal traffic.	-5	86	7	0%	S
	Site # 2A (7:58 a.m. to 9:09 a.m.)	1/2 block N of Fox Dri. on Ft. Edm. Rd. Set out carbo traps #11 & 12. Normal traffic movement during the hr.	-7	89	4	0%	SW
	Site # 3 (9:16 a.m. to 10:18 a.m.)	Stop at site # 3.	-6	85	3	0%	SE
	Site # 6B (10:24 a.m. to 11:23 a.m.)	Stop at site # 6B.	-5	80	6	0%	SW
	Site # 4 (11:32 a.m. to 12:32 p.m.)	Stop at site # 4.	0	59	5	0%	SW
	Site # 5 (12:43 p.m. to 1:42 p.m.)	Stop at site # 5.	1	55	3	0%	SW
	Site # 1 (1:59 p.m. to 3:00 p.m.)	Normal traffic movement.	1	55	3	0%	SW
	Site # 2A (3:08 p.m. to 4:06 p.m.)	On approach rd to Ft. Edm. just off Fox Dr.	1	58	2	0%	SW
	Site # 3 (4:17 p.m. to 5:26 p.m.)	Start carbo trap sample.	0	65	2	10%	SW
	Site # 6 (5:41 p.m. to 6:40 p.m.)	Dark. Light traffic.	-3	75	2	dark	S
	Site # 4 (6:54 p.m. to 7:57 p.m.)	Very light winds.	-4	78	1	dark	S
	Site # 5 (8:07 p.m. to 9:06 p.m.)	Dark. 8:09PM-NO_x readings are from fwy traffic.	-5	78	1	dark	S
13-Feb-01	Site # 1B (6:29 a.m. to 7:31 a.m.)	All in sample at site 1B.	-21	82	3	0%	E
	Site # 2 (7:40 a.m. to 8:44 a.m.)	Set out carbotrap # 14.	-25	77	3	0%	S
	Site # 6C (8:50 a.m. to 9:49 a.m.)	Laurier Heights.	-18	83	6	10%	S
	Site # 3 (9:58 a.m. to 10:59 a.m.)	Stop at site # 3.	-14	71	7	10%	SE
	Site # 4 (11:16 a.m. to 12:16 p.m.)	Stop at site #4.	-10	65	7	0%	SE
	Site # 5 (12:25 p.m. to 1:28 p.m.)	High cloud. Normal traffic.	-8	60	10	n/a	SE
	Site # 1B (1:39 p.m. to 2:40 p.m.)	High cloud. Normal traffic.	-7	61	14	80%	S
	Site # 2 (2:47 p.m. to 3:49 p.m.)	High cloud. Normal light traffic.	-5	56	7	100%	SE
	Site # 6C (3:54 p.m. to 4:59 p.m.)	High cloud. Normal traffic.	-7	63	9	100%	S
	Site # 3 (5:08 p.m. to 6:13 p.m.)	Set up carbotrap #15.	-7	66	5	n/a	SE
	Site # 4 (6:22 p.m. to 7:22 p.m.)	Dark.	-8	69	8	dark	V
	Site # 6 (7:34 p.m. to 8:35 p.m.)	Dark.	-8	79	5	dark	S
16-Feb-01	Site # 6B (6:34 a.m. to 7:34 a.m.)	Dark. Light traffic.	-16	84	3	100%	E
	Site # 2 (7:45 a.m. to 8:54 a.m.)	Set out carbotrap #16. Normal traffic movement.	-16	84	2	100%	SW
	Site # 6C (9:16 a.m. to 10:20 a.m.)	Stop at site # 6C.	-12	68	5	95%	SW
	Site # 3 (10:27 a.m. to 11:27 a.m.)	Stop at site # 3.	-12	62	5	90%	SW
	Site # 4 (11:33 a.m. to 12:33 p.m.)	Stop at site # 4.	-9	50	6	20%	SE
	Site # 5 (12:43 p.m. to 1:43 p.m.)	Stop at site # 5.	-7	41	4	0%	SW
	Site # 1B (1:53 p.m. to 3:18 p.m.)	Stop at site # 1B.	-9	46	9	0%	SW
	Site # 2A (3:24 p.m. to 4:21 p.m.)	Stop at site # 2A on fox drive.	-10	51	11	0%	S
	Site # 3 (4:29 p.m. to 5:31 p.m.)	Stop at site # 3.	-11	55	6	0%	S
	Site # 4 (5:52 p.m. to 6:56 p.m.)	Stop at site # 4.	-13	68	2	0%	S
	Site # 5 (7:05 p.m. to 8:04 p.m.)	Stop at site # 5.	-15	70	5	0%	S
	Site # 6C (8:23 p.m. to 9:22 p.m.)	Stop at site # 6C.	-16	76	3	0%	S
27-Feb-01	Site # 1 (6:41 a.m. to 7:40 a.m.)	Clear sky but dark.	-9	74	3	0%	S
	Site # 2 (7:47 a.m. to 8:49 a.m.)	Set out carbotrap tube #18.	-15	69	2	20%	S
	Site # 5 (9:01 a.m. to 10:00 a.m.)	40% cloud cover.	-3	60	8	40%	W
	Site # 4 (10:12 a.m. to 11:11 a.m.)	Stop at Site #4.	0	52	7	10%	SW
	Site # 3 (11:19 a.m. to 12:18 p.m.)	Stop at Site #3.	3	41	8	10%	SW
	Site # 6C (12:25 p.m. to 1:25 p.m.)	12:25PM-not sure where SO_2 readings are coming from.	7	35	6	10%	SW
	Site # 1 (1:36 p.m. to 2:35 p.m.)	Stop at Site #1.	8	34	9	20%	SW
	Site # 2A (2:42 p.m. to 3:41 p.m.)	200m off Fox Dr. on approach road to Ft. Edm.	9	34	7	10%	SW
	Site # 5 (3:50 p.m. to 4:50 p.m.)	Stop at Site #5.	10	32	5	5%	SW
	Site # 4 (4:59 p.m. to 6:06 p.m.)	Set out carbotrap #19 & 20 (blank) 5:31PM-Reading exh. from fwy traffic.	8	37	4	0%	SE
	Site # 3 (6:15 p.m. to 7:16 p.m.)	Stop at Site #3.	4	57	1	0%	SE
	Site # 6C (7:22 p.m. to 8:22 p.m.)	7:23PM-elevated readings but local traffic is very light. 8:00PM-local traffic increasing.	1	70	2	dark	S

List of Weather Parameters

Temp. - ambient temperature in degrees Celcius
RH - relative humidity in percent
WSP - wind speed in kilometers per hour
WDR - wind direction
Cloud - percent cloud cover
V - Variable winds

Table A14 Weather conditions and operator's observations in Whitemud Drive area survey (April and May 2001).

Date	Monitoring Location and Time (MST)	MAML Operator's Comments and Observations	Temp. °C	RH %	WSP km/h	Cloud	WDR
18-Apr-01	Site # 1 (5:34 a.m. to 6:34 a.m.)	Stop at Site #1.	1	56	7	0%	S
	Site # 2 (6:39 a.m. to 7:49 a.m.)	Set out carbotrap #21.	4	48	5	0%	W
	Site # 3 (8:03 a.m. to 9:04 a.m.)	8:17AM-exhaust may be from city repair crew 1/2 block west.	12	29	5	0%	W
	Site # 6C (9:14 a.m. to 10:14 a.m.)	Stop at site #6C.	17	18	7	0%	SW
	Site # 4 (10:25 a.m. to 11:25 a.m.)	Stop at Site#4.	15	17	11	0%	SW
	Site # 5 (11:34 a.m. to 12:33 p.m.)	Stop at Site #5.	16	15	9	0%	S
	Site # 1 (12:45 p.m. to 1:45 p.m.)	Stop at Site #1.	17	15	14	50%	SW
	Site # 2 (1:50 p.m. to 2:52 p.m.)	Stop at Site #2.	16	16	13	60%	SW
	Site # 3 (3:04 p.m. to 4:12 p.m.)	Set out carbotrap #22.	17	15	10	n/a	W
	Site # 6C (4:19 p.m. to 5:20 p.m.)	Street sweeper.	18	16	7	40%	SW
	Site # 4 (5:29 p.m. to 6:31 p.m.)	Stop at Site #4.	15	18	7	70%	W
	Site # 5 (6:38 p.m. to 7:40 p.m.)	Stop at Site #5.	13	25	6	n/a	NW
19-Apr-01	Site # 1 (5:51 a.m. to 6:54 a.m.)	6:13AM-Exhaust from vehicle close by. 6:20AM-light rain for a few minutes.	5	56	15	100%	N
	Site # 2A (7:07 a.m. to 8:08 a.m.)	Start carbotrap #23.	7	56	6	100%	SW
	Site # 3A (8:19 a.m. to 9:18 a.m.)	Stop at Site #3A.	8	47	11	100%	W
	Site # 6B (9:22 a.m. to 10:24 a.m.)	Stop at Site #6B.	9	44	9	80%	W
	Site # 4A (10:29 a.m. to 11:29 a.m.)	Stop at Site #4A.	10	42	14	80%	NW
	Site # 5A (11:40 a.m. to 12:41 p.m.)	Stop at Site #5A.	11	34	16	60%	NW
	Site # 1 (12:54 p.m. to 1:53 p.m.)	Stop at Site #1. Very lt rain near end of hr.	12	33	21	70%	N
	Site # 2A (2:10 p.m. to 3:11 p.m.)	Sunny with periods of light rain.	11	48	14	70%	W
	Site # 3A (3:18 p.m. to 4:30 p.m.)	Set up carbotraps #24 & 25.	10	51	10	90%	W
	Site # 6B (4:33 p.m. to 5:33 p.m.)	Stop at Site #6B.	10	42	9	40%	W
	Site # 4A (5:38 p.m. to 6:38 p.m.)	Stop at Site #4A.	10	39	13	20%	W
	Site # 5A (6:48 p.m. to 7:48 p.m.)	Stop at Site #5A.	6	53	10	5%	W
3-May-01	Site # 5 (5:51 a.m. to 6:51 a.m.)	6:30 AM-continuous traffic on side St.	7	35	4	80%	SW
	Site # 4 (7:10 a.m. to 8:14 a.m.)	Set out carbotrap #26.	11	30	4	80%	S
	Site # 3 (8:22 a.m. to 9:20 a.m.)	Stop at Site #3.	15	22	8	80%	SW
	Site # 6C (9:29 a.m. to 10:28 a.m.)	Stop at site #6C.	17	21	13	20%	S
	Site # 2A (10:41 a.m. to 11:40 a.m.)	Stop at site #2A.	17	20	16	0%	SW
	Site # 1A (12:02 p.m. to 12:59 p.m.)	Not downwind of fwy but had to get away from burning garbage.	19	18	12	40%	SW
	Site # 5 (1:12 p.m. to 2:12 p.m.)	80% high thin cloud.	20	17	10	80%	SW
	Site # 4 (2:22 p.m. to 3:21 p.m.)	Stop at Site #4.	22	16	9	75%	S
	Site # 3 (3:29 p.m. to 4:36 p.m.)	Set out carbo trap # 27.	22	16	8	80%	SW
	Site # 6 (4:45 p.m. to 5:44 p.m.)	Stop at Site #6C	22	17	8	70%	SW
	Site # 2 (5:53 p.m. to 6:54 p.m.)	Stop at Site # 2	20	18	7	40%	S
	Site # 1 (7:01 p.m. to 7:59 p.m.)	Stop at Site #1	18	20	5	80%	S
24-May-01	Site # 1B (5:49 a.m. to 6:49 a.m.)	Set out carbotrap #28.	17	42	4	100%	S
	Site # 2 (7:01 a.m. to 8:01 a.m.)	Stop at site #2.	18	45	3	100%	SW
	Site # 6C (8:05 a.m. to 9:05 a.m.)	Stop at site # 6C.	19	42	4	100%	W
	Site # 3A (9:24 a.m. to 10:24 a.m.)	Stop at site #3A.	21	39	4	80%	W
	Site # 4A (10:31 a.m. to 11:31 a.m.)	11:20AM-Pick up smoke from forest fire at Chisolm.	23	32	11	n/a	W
	Site # 5A (11:42 a.m. to 12:42 p.m.)	Area still smoky. 12:27PM-Smoke now very heavy. 12:28PM-Elevated PAH's & O_3 suspect due to smoke interference.	24	29	13	80%	SW
	Site # 1B (12:57 p.m. to 1:57 p.m.)	Still smokey.	27	25	6	smokey	S
	Site # 2A (2:11 p.m. to 3:11 p.m.)	Smokey. Lt rain. 4:55PM-Stopped raining.	27	25	11	smokey	S
	Site # 3A (3:20 p.m. to 4:20 p.m.)	Set out carbotrap #29 at 3:25PM. Elevated NO_x and PAH during the hr.	27	25	7	smokey	SW
	Site # 6B (4:29 p.m. to 5:29 p.m.)	Smokey. Lt rain. 4:55PM-Stopped raining.	25	30	5	smokey	S
	Site # 4A (5:34 p.m. to 6:34 p.m.)	Less smoke in the air.	23	37	4	smokey	S
	Site # 5A (6:44 p.m. to 7:44 p.m.)	Light smoke still visible. Light rain.	21	46	5	smokey	W

List of Weather Parameters

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WSP - wind speed in kilometers per hour
WDR - wind direction
Cloud - percent cloud cover
V - Variable winds